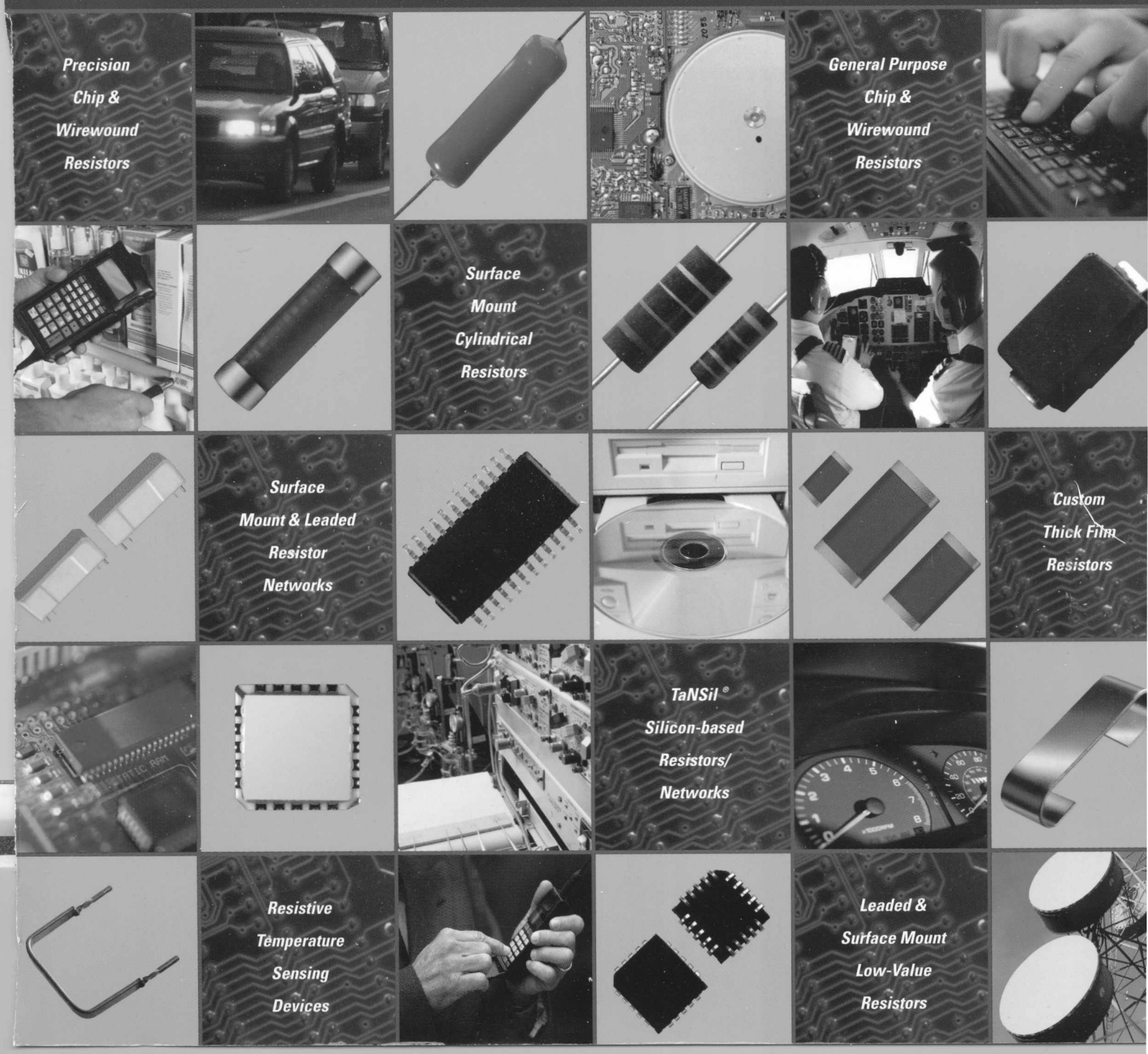
IRC

A Subsidiary of TT Group PLC

Product Selection Guide 2000



QUALITY POLICY

OVERVIEW:
International Resistive Company, Inc. fully supports our customers' quality requirements and will continue to pursue the highest quality standards attainable. Top management and staff create an atmosphere and the attitude required for meeting such a goal.

RESPONSIBILITY:
Each Divisional Vice President and General Manager is responsible for setting strategic goals and objectives to implement a successful Total Quality Management (TQM) program. This program emphasizes the use of Statistical Process Control (SPC) and Design of Experiments together with tracking and reporting our quality system in terms of Parts Per Million (PPM).

POLICY:
IRC, Inc. is committed to a policy of continuous improvement to build quality into all products we produce. It is our company's mission to continually assess our progress and actions necessary to meet our strategic goals and to provide the customer with the highest quality product.

GOAL:
Our goals are zero defects, total customer satisfaction and 100% on-time delivery.

***** Please Note:***
All divisions of IRC are QS-9000 registered.

Standard EIA
Decade Values Table

ISO-9001 Registered

E-192 0.1% 0.25% 0.50%	E-96 1%	E-192 0.10% 0.25% 0.50%	E-96 1%	E-192 0.10% 0.25% 0.50%	E-96 1%	E-192 0.10% 0.25% 0.50%	E-96 1%	E-192 0.10% 0.25% 0.50%	E-96 1%	E-192 0.10% 0.25% 0.50%	E-96 1%	E-24 2% 5%	E-12 10%
10.0	10.0	14.7	14.7	21.5	21.5	31.6	31.6	46.4	46.4	68.1	68.1	10	10
10.1	---	14.9	---	21.8	---	32.0	---	47.0	---	69.0	---	11	12
10.2	10.2	15.0	15.0	22.1	22.1	32.4	32.4	47.5	47.5	69.8	69.8	12	15
10.4	---	15.2	---	22.3	---	32.8	---	48.1	---	70.6	---	13	18
10.5	10.5	15.4	15.4	22.6	22.6	33.2	33.2	48.7	48.7	71.5	71.5	15	22
10.6	---	15.6	---	22.9	---	33.6	---	49.3	---	72.3	---	16	27
10.7	10.7	15.8	15.8	23.2	23.2	34.0	34.0	49.9	49.9	73.2	73.2	18	33
10.9	---	16.0	---	23.4	--	34.4	---	50.5	---	74.1	--	20	39
11.0	11.0	16.2	16.2	23.7	23.7	34.8	34.8	51.1	51.1	75.0	75.0	22	47
11.1	---	16.4	---	24.0	--	35.2	---	51.7	---	75.9	---	24	56
11.3	11.3	16.5	16.5	24.3	24.3	35.7	35.7	52.3	52.3	76.8	76.8	27	68
11.4	---	16.7	---	24.6	---	36.1	---	53.0	---	77.7	---	30	82
11.5	11.5	16.9	16.9	24.9	24.9	36.5	36.5	53.6	53.6	78.7	78.7	33	
11.7	---	17.2	---	25.2	---	37.0	---	54.2	---	79.6	---	36	
11.8	11.8	17.4	17.4	25.5	25.5	37.4	37.4	54.9	54.9	80.6	80.6	39	
12.0	---	17.6	---	25.8	---	37.9	---	55.6	---	81.6	---	43	
12.1	12.1	17.8	17.8	26.1	26.1	38.3	38.3	56.2	56.2	82.5	82.5	47	
12.3	---	18.0	---	26.4	---	38.8	---	56.9	---	83.5	---	51	
12.4	12.4	18.2	18.2	26.7	26.7	39.2	39.2	57.6	57.6	84.5	84.5	56	
12.6	---	18.4	---	27.1	---	39.7	---	58.3	---	85.6	---	62	
12.7	12.7	18.7	18.7	27.4	27.4	40.2	40.2	59.0	59.0	86.6	86.6	68	
12.9	---	18.9	---	27.7	---	40.7	---	59.7	---	87.6	---	75	
13.0	13.0	19.1	19.1	28.0	28.0	41.2	41.2	60.4	60.4	88.7	88.7	82	
13.2	---	19.3	---	28.4	---	41.7	---	61.2	---	89.8	---	91	
13.3	13.3	19.6	19.6	28.7	28.7	42.2	42.2	61.9	61.9	90.9	90.9		
13.5	---	19.8	---	29.1	---	42.7	---	62.6	---	92.0	---		
13.7	13.7	20.0	20.0	29.4	29.4	43.2	43.2	63.4	63.4	93.1	93.1		
13.8	---	20.3	---	29.8	---	43.7	---	64.2	---	94.2	---		
14.0	14.0	20.5	20.5	30.1	30.1	44.2	44.2	64.9	64.9	95.3	95.3		
14.2	---	20.8	---	30.5	---	44.8	---	65.7	---	96.5	---		
14.3	14.3	21.0	21.0	30.9	30.9	45.3	45.3	66.5	66.5	97.6	97.6		
14.5	---	21.3	---	31.2	---	45.9	---	67.3	---	98.8	---		

INTERNATIONAL RESISTIVE COMPANY, INC
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IRC Web Site: http://www.irctt.com
IRC Fax-on-Demand: 1-888-IRC-DATA (472-3282)

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IRC CONTACTS

Regional Sales Manager

Name:
Phone:
Fax:
E-Mail:

Customer Service

Name:
Phone:
Fax:
E-Mail:

Area Representative

Name:
Phone:
Fax:
E-Mail:

Area Distributors

Name:
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NOTES:

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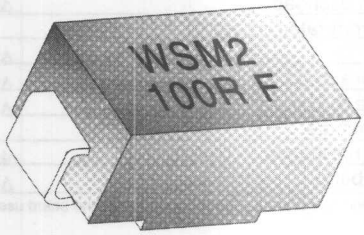
MOLDED SURFACE MOUNT WIREWOUND RESISTOR

ISO-9001 Registered

IRC

WSM SERIES



- All welded construction
- Ideal for automatic pick and place
- Direct replacement for axial resistors
- Contact factory for ohmic values above published ranges

SPECIFICATIONS:

		WSM1	WSM2	WSM3	
Power rating at 70°C	watts	1	2	3	
Resistance range	ohms	0.01 to 1K	0.01 to 2K	0.01 to 10K	
Limiting element voltage	volts	100	100	100	
TCR	ppm/°C	<10Ω : 100	<1Ω : 100	≤ .03Ω : 700	≤ 0.1Ω : 200
		>10Ω : 20	>1Ω : 20	≤ 10Ω : 100	> 10Ω : 20
Resistance tolerance	%	*1, 2, 5, 10			
Standard values		E24 preferred			
Ambient temperature	°C	-55 to 155			

*Note: 5% or 10% preferred below 0.1 ohms.

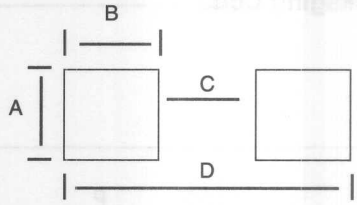
Construction:
A high purity ceramic substrate is assembled with interference fit end caps to which are welded the terminations. The resistive element is wound on the substrate and welded to the caps. The unit is then molded.

Flammability:
The resistor coating is categorized as flame retardant epoxy under UL-94.

Solvent Resistance:
The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

Marking:
WSM resistors are legend marked with type, value and tolerance.

Recommended Pad Sizes:



		A	B	C	D
WSM1	in (mm)	.115 (2.9)	.100 (2.6)	.100 (2.6)	.389 (9.9)
WSM2	in (mm)	.134 (3.4)	.158 (4.0)	.237 (6.0)	.552 (14.0)
WSM3	in (mm)	.134 (3.4)	.178 (4.5)	.434 (11.0)	.788 (20.0)

Dimensions:

P/N		L	I	W	w	H
WSM-1	in (mm)	.310 max (7.9 max)	.100 nom (2.54 nom)	.275 max (7.0 max)	.165 max (4.2 max)	.155 max (3.94 max)
WSM -2	in (mm)	.473 max (12 max)	.122 nom (3.1 nom)	.413 max (10.5 max)	.260 max (6.6 max)	.217 max (5.5 max)
WSM-3	in (mm)	.709 max (18 max)	.122 nom (3.1 nom)	.630 max (16 max)	.276 max (7 max)	.256 max (6.5 max)

WIREWOUND AND FILM TECHNOLOGIES DIVISION
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ISO-9001 Registered

IRC

WSM PERFORMANCE DATA:

		WSM1	WSM2	WSM3
Load at rated power: 1000 hrs @ 70°C	ΔR%	2 ± 0.001Ω	2 ± 0.001Ω	3 ± 0.001Ω
Dry heat 1000 hrs @ 155°C	ΔR%	2 ± 0.001Ω	2 ± 0.001Ω	3 ± 0.001Ω
Short term overload	ΔR%	2 ± .001Ω		
Derating from rated power @ 70°C		zero at 155°C		
Moisture	ΔR%	1 ± .001Ω	1 ± .001Ω	1.5 ± .001Ω
Temperature cycling	ΔR%	1 ± .001Ω		
Resistance to solder heat	ΔR%	1 ± .001Ω		
Isolation voltage	V	1,000		
Insulation resistance	ohms	>1000M		
Substrate bend	ΔR%	0.2 ± .001Ω		

Note: The power ratings to be applied depend upon the board used and the ambient temperature.

HOW TO ORDER:

Specify type, reference, etc. as indicated in this example of a WSM3 6.8K ohms 5% resistor with tape and reel packaging.

WSM3 6K8 J R

Type — WSM3

Value — 6K8

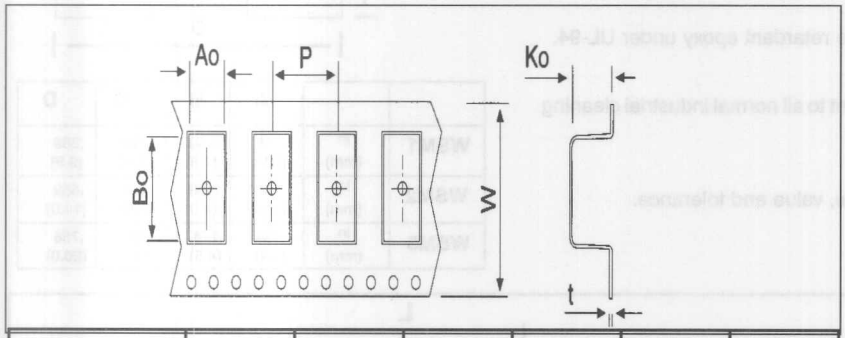
Tolerance — J
(F=1%, G=2%, J=5%, K=10%

Packaging Code — R

STANDARD QUANTITIES PER PACKAGE:

Type	Code	WSM1	WSM2	WSM3
13" Reel (330mm)	R	1500	800	750

Packaging:
WSM2 resistors are supplied on .945 (24mm) wide carrier tape.
WSM3 resistors are supplied on 1.26 (32mm) wide carrier tape.
Both products are reeled onto 13.00 (330mm) diameter reels.



	Ao	Bo	Ko	W	P	T
WSM1	.165	.300	.165	.630	.315	.014
	(4.2)	(7.62)	(4.20)	(16.0)	(8.00)	(0.36)
WSM2	.266	.470	.206	.945	.473	.014
	(6.75)	(11.95)	(5.22)	(24.0)	(12.0)	(0.36)
WSM3	.288	.721	.264	1.26	.473	.016
	(7.3)	(18.3)	(6.7)	(32.0)	(12.0)	(0.4)

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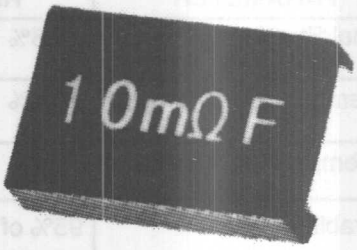
CURRENT DETECTING CHIP RESISTOR

ISO-9001 Registered

IRC

WSML SERIES



- Surface Mount type current detecting resistor
- Molding with flameproof polymer (UL94 V-0)
- Excellent dimension accuracy, mountability and shock resistance.
- Suitable for flow, reflow and hand soldering.

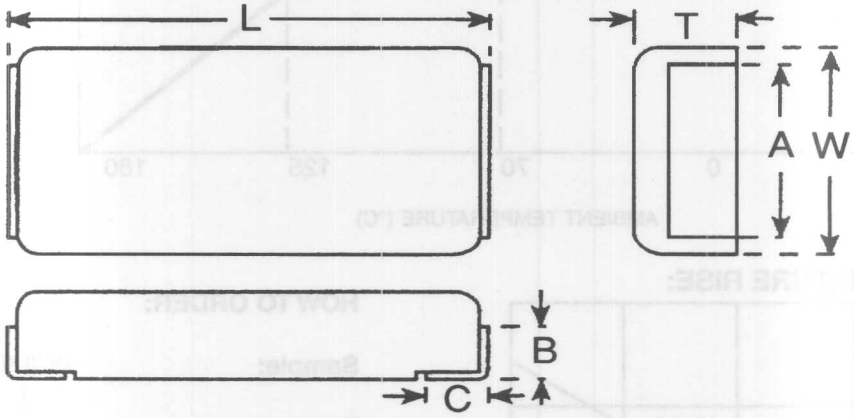
FEATURES:

- Excellent dimensional accuracy, mountability and shock resistance. Due to liquid crystal polymer mold.
- Excellent terminal strength and solderability due to electrode material of metal.

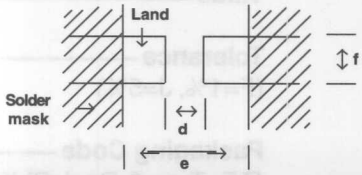
RATING:

TYPE	POWER RATING	RESISTANCE RANGE	RESISTANCE TOLERANCE	TCR	RATED AMBIENT TEMP.	OPERATING TEMP. RANGE
WSML-1	1W	5mΩ - 10KΩ	J(±5%) & F (±1%)	R≤13mΩ ±180 ppm/°C	+70°C	-55°C to +180°C
WSML-2	2W			R≥13mΩ ±100 ppm/°C		

TYPE	DIMENSIONS (inches & (mm))					
	L	W	t	a	b	c
WSML-1	0.248	0.122	0.075	0.094	0.047	0.047
	(6.3 ± 0.3)	(3.1 ± 0.2)	(1.9 ± 0.2)	(2.4 ± 0.2)	(1.2 ± 0.3)	(1.2 ± 0.3)
WSML-2	0.453	0.276	0.098	0.196	0.067	0.067
	(11.5 ± 0.3)	(7.0 ± 0.02)	(2.5 ± 0.2)	(5.0 ± 0.2)	(1.7 ± 0.2)	(1.7 ± 0.3)



Recommended Land Pattern



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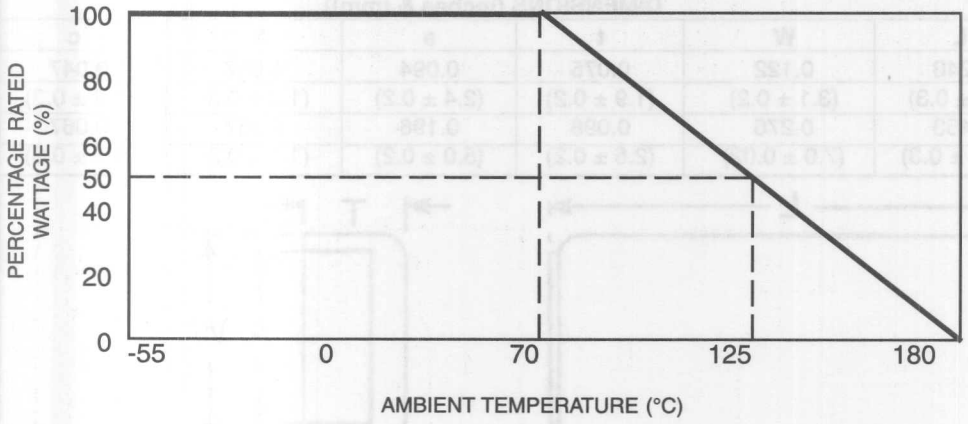
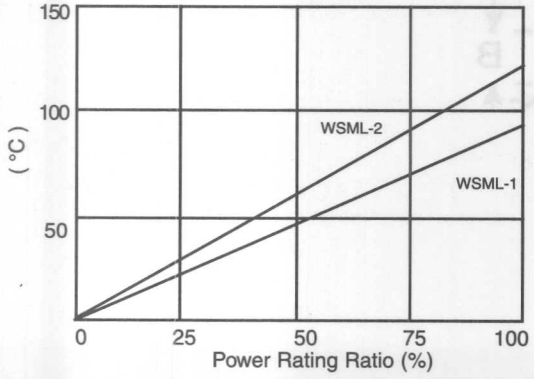
ENVIRONMENTAL & MECHANICAL CHARACTERISTICS:

PARAMETER	REQUIREMENT	TEST METHOD
Thermal Shock	±0.5%	MIL-STD-202, Method 107 -55°C ~ +125°C, 5 cycles
Low Temperature Exposure	±0.5%	MIL-R-55342 p 4.7.4 1 Hour @ -55°C followed by 45 minutes of RCWV**
High Temperature Exposure	±0.5%	MIL-R-55342 p 4.7.6 100 Hours @ 125°C
Solderability	95% of the terminal should be covered with new solder	Immerse in solder at 230°C ±5°C for 3 ± 0.5 seconds
Resistance to Solder Heat	±1.0% maximum	MIL-R-55342 p 4.7.7 260°C for 10 seconds
Terminal Strength-Bend	±0.5%	5mm Deflection in either direction for 10 seconds
Moisture Resistance	±2.0% maximum No evidence of damage	MIL-STD-202, Method 106 10 cycles for 240 hours
Life	±2.0% maximum No evidence of damage	MIL-STD-202, Method 108 70°C, 1000 hours @ RCWV**, 1.5 Hr on, 0.5 Hr off
Pulse	±1.5%	2.5 x RCWV**, But not exceeding maximum overload voltage 1 seconds ON, 25 seconds OFF, 10,000 cycles
Temperature Cycling	±1.0% maximum No mechanical damage	30 Minutes at -55°C: 15 Minutes at +25°C, 30 Minutes at +125°C, 15 Minutes at +25°C, 5 Cycles

**RCWV = Rated Continuous Working Voltage



TEMPERATURE RISE:



HOW TO ORDER:

Sample: WSML1 10mΩ F TE

Type — WSML1

Value — 10mΩ

Tolerance — F
(F=1%, J=5%)

Packaging Code — TE
(TE=Tape & Reel, BLK=Bulk)

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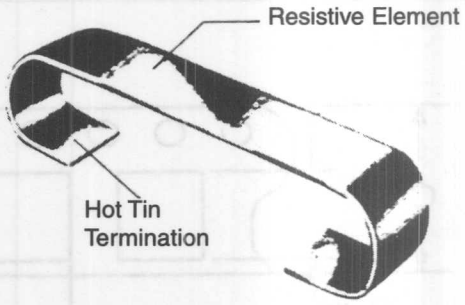
OPEN AIR SENSE RESISTORS

ISO-9001 Registered

OARS SERIES



- Open air design provides cooler operation
- ±1% or ±5% tolerance
- Down to 0.033 ohm
- Resistance wire TCR ±20 ppm/°C
- Contact factory for values from 0.05 to 0.1 ohms and intermediate ranges
- 50V continuous pulse rating/rated voltage

SPECIFICATIONS:

IRC Type	IRC Power Rating (watts)	Standard Resistance* (ohms)
OARS-1	1W @ 85°C 2W @ 25°C	.003, .004 .005, .010, .015, .020, .025, .030, .040, .050

* Contact factory for values outside these specifications.

FEATURES:

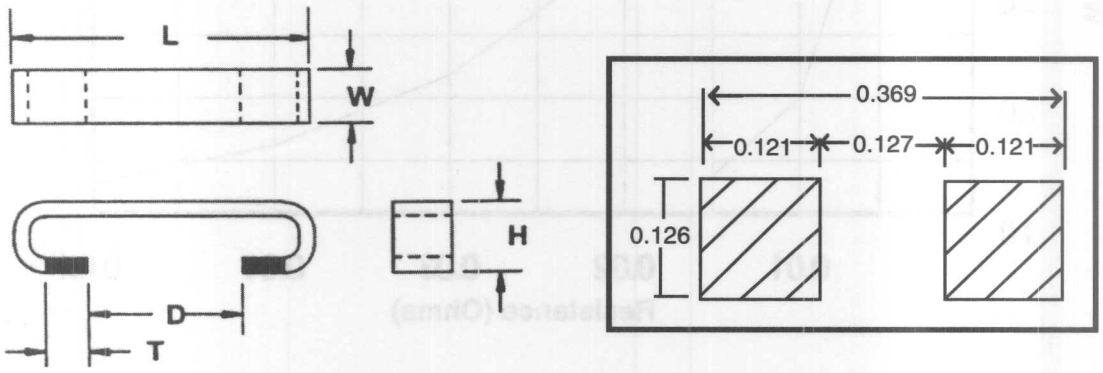
- Superior thermal expansion cycling
- Inductance less than 10 nanohenries
- Flameproof
- Solderable pads (60/40 solder plated)
- Lead flexible for thermal expansion
- Low termination stress ("J" leads)

APPLICATIONS:

- Current sensing
- Feedback
- Low inductance
- Surge and pulse
- AC applications (please contact the factory)

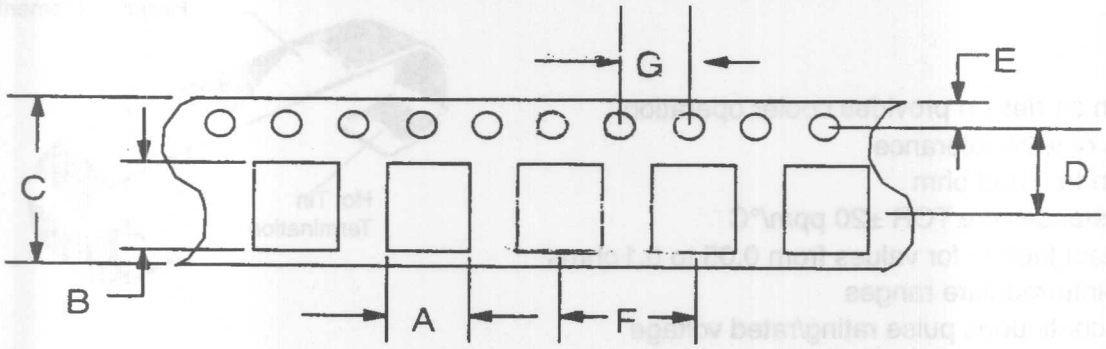
OPERATING CHARACTERISTICS:

- Load life @ 70°C (1000 hrs): 1% D max.
- Moisture no load (1000 hrs): 1% D max.
- Temperature cycle @ -40°C & +125°C (1000 cyc): 1% max.



IRC Type	L	H	T	D	W
OARS-1	$0.440^{\pm0.015}$ ($11.18^{\pm0.381}$)	$0.120^{\pm0.030}$ ($3.05^{\pm0.762}$)	$0.093^{\pm0.010}$ ($2.36^{\pm0.254}$)	$0.190^{\pm0.030}$ ($4.83^{\pm0.762}$)	$0.125^{\pm.015}$ (3.175^{max})

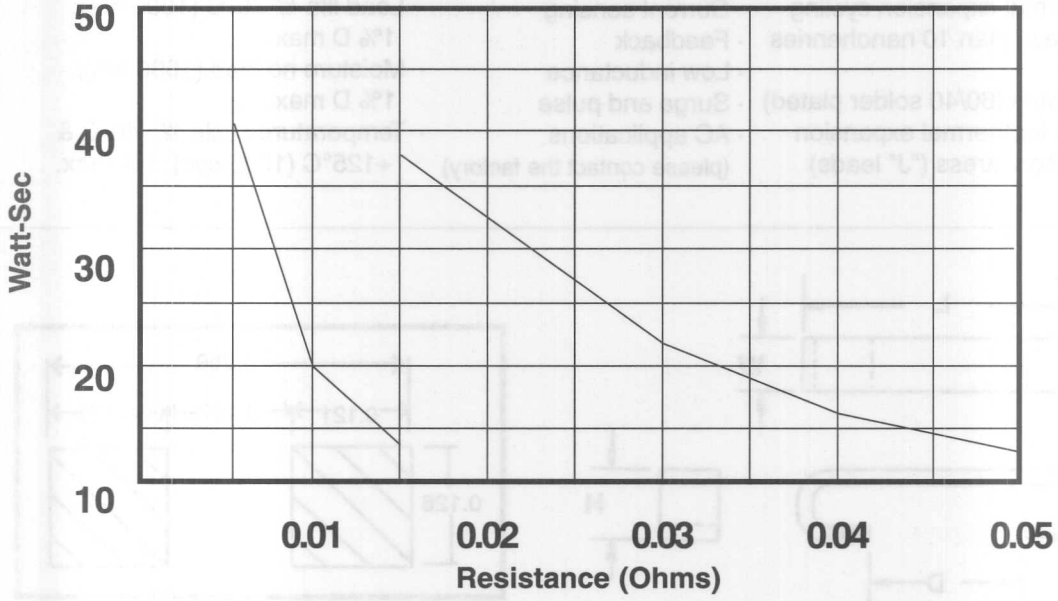
OARS TAPE SPEC



TAPE DIMENSIONS:

Size		A	B	C	D	E	F	G
OARS	in.	0.17±0.003	0.461±0.003	0.945±0.010	0.453±0.004	0.069±0.004	0.315±0.004	0.157±0.004
	mm.	(4.32±0.08)	(11.7±0.08)	(24.0±0.30)	(11.5±0.10)	(1.75±0.10)	(8.0±0.10)	(4.0±0.1)

OARS Pulse Surge Curve



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METAL GLAZE™ CYLINDRICAL SURFACE MOUNT RESISTORS

ISO-9001 Registered

CHP SERIES

- GENERAL PURPOSE (pgs. 9, 10)

MRC SERIES

- HIGH POWER DENSITY (pgs. 11, 12)

MCHP SERIES

- HIGH RELIABILITY (pg. 13)

CHPT SERIES

- TEMPERATURE SENSITIVE (pgs. 14, 15)

ZCHP SERIES

- ZEROHM JUMPERS (pg. 16)

- High power - up to 2 watts
- Low resistance - down to 0.1 ohm at 1% tolerance
- High resistance - up to 2.21 megohm
- Precision - ±1% standard
- Low TCR - ±100ppm/°C standard
- High voltage - up to 1000 volts
- Low inductance
- Superior surge handling capability
- -55°C to +150°C operating temperature
- Military versions
- Negative temperature coefficient version
- Zerohm jumpers
- Low-profile/minimum board real estate requirement
- Superb solderability - wave and reflow
- Established SPC & continuous improvement programs
- Excellent service and quality record/proven reliability
- High volume production capability

PRODUCT HISTORY:

The CHP Surface Mount Resistor Series is a member of the RG product family of precision Metal Glaze™ Resistors. The Metal Glaze™ technology, developed by IRC in 1960 to meet the stringent demands of the Military market, provides an unsurpassed combination of ruggedness, performance, and low cost. Since its development, IRC has supplied billions of units to meet the specific requirements not only of the Military, but also to all major users of resistive components requiring reliability, service, and quality at a reasonable price. Proven reliability of the Metal Glaze™ resistor family is supported by well over a billion unit hours of life testing with no failures.

The CHP Resistor was developed in 1980 by IRC to support the automotive move toward surface mount technology. The CHP uses the same highly reliable Metal Glaze™ technology and materials as its leaded counterpart. The termination and encapsulation have been modified to provide compatibility with surface mount technology. Since its development, the CHP has proven its reliability and service record by becoming a "World Class Product" supporting the surface mount needs of the Automotive, Computer, Instrumentation, Telecommunication, and other industrial electronics market.

PRODUCT DESCRIPTION:

The CHP is a precision surface mount power resistor. Its cylindrical shape is composed of a Metal Glaze™ resistive element fired onto a ceramic core with capless solder terminations. The simplicity of design and construction, provide a cost effective solution to common applications where reliability is a major concern, and also offer some unique features to surface mount technology.

The CHP uses a cylindrical high alumina ceramic for the core of the resistor. This substrate provides excellent thermal conductivity for maximum power dissipation in a minimum of board real estate. It also provides superb mechanical strength to easily withstand stresses presented during board assembly, mounting, and operation.

The Metal Glaze™ is composed of glass and metal particles which are fired onto the ceramic substrate at approximately 1000°C. This technology provides a resistive element that is impervious to environmental conditions without the need for an airtight encapsulation. The inherent ruggedness of this glaze can absorb higher voltage surges and overloads than "thin-film" counterparts.

To terminate the CHP, an electroless nickel barrier is applied to the termination area. Solder is then applied by hot-solder dipping. This technique provides reliable electrical continuity through the termination without the use of end-caps or weld joints. Unlike the typical "MELF", there is no "dog-bone" shape resulting from end-caps to interfere with "pick and place" accuracy. The solder termination is free of silver to provide superb solderability performance on both reflow and wave soldering processes.

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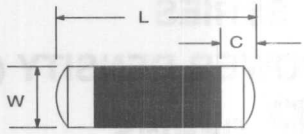
CHP FAMILY STANDARD SIZES, SOLDER PADS AND PACKAGING:

DIMENSIONS (Inches and (mm)):

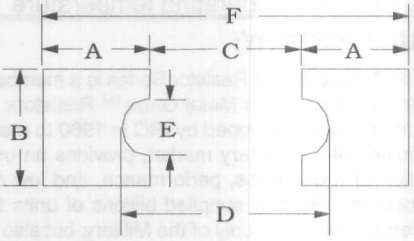


Size Code	Industry Footprint	Actual Size	L	W	C
B	1206		0.128±0.007 (3.25±0.18)	0.057±0.006 (1.45±0.15)	0.020±0.010 (0.51±0.25)
C	1206		0.128±0.007 (3.25±0.18)	0.063±0.010 (1.60±0.25)	0.020±0.010 (0.51±0.25)
D	2010		0.200±0.010 (5.08±0.25)	0.079±0.006 (2.01±0.15)	0.030±0.010 (0.761±0.25)
E	2010		0.200±0.010 (5.08±0.25)	0.105±0.006 (2.67±0.15)	0.040±0.015 (1.02±0.38)
F	2512		0.251±0.010 (6.38±0.25)	0.079±0.006 (2.01±0.15)	0.040±0.010 (1.02±0.25)
H	3610		0.367±0.010 (9.32±0.25)	0.105±0.006 (2.67±0.15)	0.050±0.010 (1.27±0.25)

RECOMMENDED SOLDER PAD DIMENSIONS (REFLOW):

To ensure excellent solderability performance, IRC recommends the following pad design. This design will provide a large repeatable solder fillet to the CHP resistor on reflow processes and will provide maximum heat transfer to the PC board in high power applications. By placing the CHP on the solder paste while the paste is in the "tacky" state, the CHP will be held in position until solder reflow begins. The pad design then uses the surface tension of the molten solder to pull the component to the center of the solder pad. The placement of a via rising above the board level directly beneath the CHP is not recommended.

Size Code	Industry Footprint	Dimensions (Inches and (mm))					
		A	B	C	D	E	F
B&C	1206	0.076 (1.93)	0.093 (2.36)	0.058 (1.47)	0.098 (2.49)	0.032 (0.81)	0.211 (5.36)
D	2010	0.111 (2.82)	0.126 (3.20)	0.096 (2.44)	0.152 (3.86)	0.040 (1.02)	0.318 (8.08)
E	2010	0.170 (4.32)	0.160 (4.06)	0.072 (1.83)	0.132 (3.35)	0.044 (1.12)	0.412 (10.46)
F	2512	0.121 (3.07)	0.126 (3.20)	0.127 (3.23)	0.183 (4.65)	0.040 (1.02)	0.369 (9.37)
H	3610	0.170 (4.32)	0.160 (4.06)	0.213 (5.41)	0.273 (6.93)	0.044 (1.12)	0.553 (14.05)



STANDARD REEL PACKAGING PER EIA-481:

Size Code	Industry Footprint	Reel Diameter*	Quantity Per Reel	Carrier Tape Width	Component Pitch
B&C	1206	7"	2,500 max.	8mm	4mm
		13"	10,000 max.		
D	2010	7"	1,500 max.	12mm	4mm
		13"	5,000 max.		
E	2010	7"	1,500 max.	12mm	4mm
		13"	5,000 max.		
F	2512	13"	5,000 max.	12mm	4mm
H	3610	7"	1,500 max.	24mm	4mm

* The 13" reel is considered standard and will be supplied unless otherwise specified.

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METAL GLAZE™ GENERAL PURPOSE SURFACE MOUNT POWER RESISTOR

ISO-9001 Registered

IRC

CHP SERIES

- Up to 2 watts
- 0.1 ohm to 2.2 megohm range
- Up to 1000 volts
- 150°C maximum operating temperature

CHP SPECIFICATIONS:

Size Code[1]	Industry Footprint	IRC Type	Maximum Power Rating	Working Voltage[2]	Maximum Voltage	Resistance Range (ohms)[3]	Tolerance (±%)[3]	TCR (ppm/°C)[3]	Product Category
B	1206	CHP 1/8	1/4W @ 70°C	200	400	0.1 to 0.99	1, 2, 5	100	Low Range
						1.0 to 1.0 M	1, 2, 5	50, 100	Standard
						20 to 348K	0.25, 0.5	50, 100	Tight Tolerance
D	2010	CHP 1/2	1/2W @ 70°C	300	600	0.1 to 0.99	1, 2, 5	100	Low Range
						1.0 to 348K	1, 2, 5	50, 100	Standard
F	2512	CHP 1	1W @ 70°C	350	700	0.1 to 0.99	1, 2, 5	100	Low Range
						1.0 to 2.21M	1, 2, 5	50, 100	Standard
						20 to 348K	0.25, 0.5	50, 100	Tight Tolerance
H	3610	CHP 2	2W @ 25°C 1.33W @ 70°C	500	1000	0.2 to 0.99	1, 2, 5	100	Low Range
						1.0 to 2.21M	1, 2, 5	50, 100	Standard

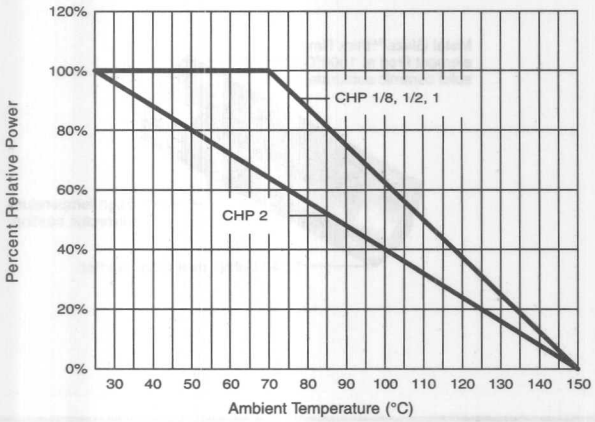
[1]See page 8 for product dimensions, recommended solder pads, and standard packaging. [2]Not to exceed $\sqrt{PxR}$ [3]Consult factory for tighter TCR, tolerance, or resistance values.

CHP PERFORMANCE CHARACTERISTICS:

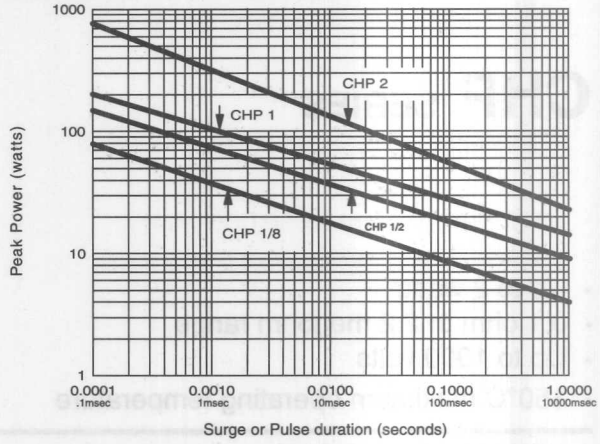
Characteristics	Maximum Change	Test Method
Temperature Coefficient	As specified	MIL-R-55342E Par 4.7.9 (-55°C +125°C)
Thermal Shock	±0.5% +0.01 ohm	MIL-R-55342E Par 4.7.3 (-65°C +150°C, 5 cycles)
Low Temperature Operation	±0.25% +0.01 ohm	MIL-R-55342E Par 4.7.4 (-65°C @ working voltage)
Short Time Overload	±0.5% +0.01 ohm ±1% for R>100K ohm	MIL-R-55342E Par 4.7.5 2.5 x $\sqrt{PxR}$ for 5 seconds
High Temperature Exposure	±0.5% +0.01 ohm	MIL-R-55342E Par 4.7.6 (+150°C for 100 hours)
Resistance to Bonding Exposure	±0.25% 0.01 ohm	MIL-R-55342E Par 4.7.7 (Reflow soldered to board at 260°C for 10 seconds)
Solderability	95% minimum coverage	MIL-STD-202, Method 208 (245°C for 5 seconds)
Moisture Resistance	±0.5% +0.01 ohm	MIL-R-55342E Par 4.7.8 (10 cycles, total 240 hours)
Life Test	±0.5% +0.01 ohm	MIL-R-55342E Par 4.7.10 (2000 hour at 70°C intermittent)
Terminal Adhesion Strength	±1% +0.01 ohm no mechanical damage	1200 gram push from underside of mounted chip for 60 seconds
Resistance to Board Bending	±1% + 0.01 ohm no mechanical damage	Chip mounted in center of 90mm long board, deflected 5mm so as to exert pull on chip contacts for 10 seconds

ISO-9001 Registered

CHP POWER DERATING CURVE:



CHP REPETITIVE SURGE CURVE:



Note: Use for repetitive pulses where the average power dissipation is not to exceed the component rating at 70°C. Surge handling capacity for low-repetitive surges may be significantly greater than shown above. Contact factory for recommendations.

HOW TO ORDER:

Sample Part No. **CHP 1 - 100 - 2203 - F - 13**

IRC Type
(CHP 1/8, CHP 1/2, CHP 1, or CHP 2)

Temperature Coefficient
(50 or 100)

Resistance Value
(100 ohms and greater - First 3 significant figures plus 4th digit multiplier)
Example: 100 ohms = 1000, 1000 ohms = 1001, 150,000 ohms = 1503
(Less than 100 ohms - "R" is used to designate decimal)
Example: 51 ohms = 51R0, 1 ohm = 1R00, 0.25 ohm = R250

Tolerance
(C = 0.25%, D = 0.5%, F = 1.0%, G = 2.0%, J = 5.0%)

Packaging Code*
(BLK = Bulk, 7=7" Reel, 13=13" Reel)
*See page 8 for packaging details

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METAL GLAZE™ HIGH POWER DENSITY SURFACE MOUNT POWER RESISTOR

ISO-9001 Registered

MRC SERIES

- 1/2 watt in 1/8 watt package (1206 footprint)
- 1 watt in 1/2 watt package (2010 footprint)
- MRC1/2: 0.1 ohm to 10,000 ohm
- MRC1: 0.05 ohm to 1.0 ohm (contact factory for higher values)
- 150°C maximum operating temperature
- Superior surge handling capability

MRC SPECIFICATIONS:

Size Code[1]	Industry Footprint	IRC Type	Maximum Power Rating	Working Voltage[2]	Maximum Voltage	Resistance Range (ohms)[3]	Tolerance (±%)[3]	TCR (ppm/°C)[3]	Product Category
C	1206	MRC1/2	1/2W @ 70°C	200	400	0.1 to 0.99	1, 2, 5	100	Low Range
						1.0 to 10K	1, 2, 5	50, 100	Standard
						20 to 10K	0.25, 0.5	50, 100	Tight Tolerance
E	2010	MRC1	1W @ 70°C	350	700	0.05 to 0.099	2, 5	200	Low Range
						0.10 to 1.0	1, 2, 5	100	Low Range

[1]See page 8 for product dimensions, recommended solder pads, and standard packaging. [2]Not to exceed $\sqrt{PxR}$ [3]Consult factory for tighter TCR, tolerance, or resistance values.

MRC APPLICATIONS:

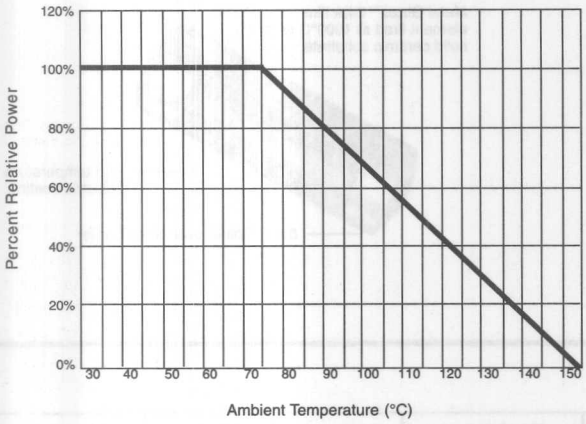
The MRC1/2 will dissipate 1/2 watt at 70°C on a 1206 footprint, while the MRC 1 will dissipate 1 watt at 70°C on a 2010 footprint. The MRC is recommended for applications where board real estate is a major concern. Due to the high power density and superior surge handling capability, it is also recommended as a direct replacement on existing board designs where standard 1206 or 2010 resistors are marginal or failing.

MRC PERFORMANCE CHARACTERISTICS:

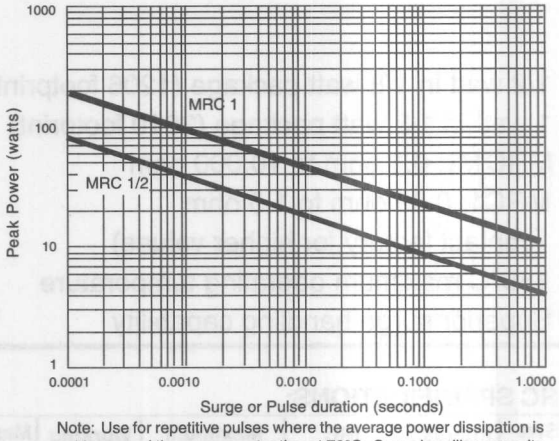
Characteristics	Maximum Change	Test Method
Temperature Coefficient	As specified	MIL-R-55342E Par 4.7.9 (-55°C +125°C)
Thermal Shock	±(0.5% +0.01 ohm)	MIL-R-55342E Par 4.7.3 (-65°C +150°C, 5 cycles)
Low Temperature Operation	±(0.25% +0.01 ohm)	MIL-R-55342E Par 4.7.4 (-65°C @ working voltage)
Short Time Overload	±(1.0% +0.01 ohm)	MIL-R-55342E Par 4.7.5 2.5 x $\sqrt{PxR}$ for 5 seconds
High Temperature Exposure	±(0.5% +0.01 ohm)	MIL-R-55342E Par 4.7.6 (+150°C for 100 hours)
Resistance to Bonding Exposure	±(0.25% 0.01 ohm)	MIL-R-55342E Par 4.7.7 (Reflow soldered to board at 260°C for 10 seconds)
Solderability	95% minimum coverage	MIL-STD-202, Method 208 (245°C for 5 seconds)
Moisture Resistance	±(0.5% +0.01 ohm)	MIL-R-55342E Par 4.7.8 (10 cycles, total 240 hours)
Life Test	±(1.0% +0.01 ohm)	MIL-R-55342E Par 4.7.10 (2000 hour at 70°C intermittent)
Terminal Adhesion Strength	±(1% +0.01 ohm) no mechanical damage	1200 gram push from underside of mounted chip for 60 seconds
Resistance to Board Bending	±(1% + 0.01 ohm) no mechanical damage	Chip mounted in center of 90mm long board, deflected 5mm so as to exert pull on chip contacts for 10 seconds

ISO-9001 Registered

MRC POWER DERATING CURVE:



MRC REPETITIVE SURGE CURVE:



Note: Use for repetitive pulses where the average power dissipation is not to exceed the component rating at 70°C. Surge handling capacity for low-repetitive surges may be significantly greater than shown above. Contact factory for recommendations.

HOW TO ORDER:

Sample Part No.

MRC1/2 - 100 - 1000 - F - 13

IRC Type
(MRC 1/2 & MRC 1)

Temperature Coefficient
(50 or 100)

Resistance Value
(100 ohms and greater - First 3 significant figures plus 4th digit multiplier)
Example: 100 ohms = 1000, 1000 ohms = 1001, 150,000 ohms = 1503
(Less than 100 ohms - "R" is used to designate decimal)
Example: 51 ohms = 51R0, 1 ohm = 1R00, 0.25 ohm = R250

Tolerance
(C = 0.25%, D = 0.5%, F = 1.0%, G = 2.0%, J = 5.0%)

Packaging Code*
(BLK = Bulk, 7=7" Reel, 13=13" Reel)
*See page 8 for packaging details

WIREWOUND AND FILM TECHNOLOGIES DIVISION
736 Greenway Road • Boone, North Carolina 28607-1860 • Tel: 828-264-8861 • Fax: 828-264-8866 • www.irctt.com

HIGH RELIABILITY SURFACE MOUNT RESISTOR

ISO-9001 Registered

IRC

MCHP SERIES

- Reliable Metal Glaze™ technology
- Superb solderability - reflow & wave
- Minimum board real estate requirements
- Established SPC and continuous improvement programs
- Operating temperature -55°C to +150°C

The MCHP High Reliability Surface Mount Resistors are part of the RG product family of precision resistors developed by IRC in 1960 to meet the stringent demands of the military market. In leaded form, these resistors are qualified to level S under MIL-R-39017 and MIL-R-55182. The MCHP resistor utilizes the core element from this series, but with modified contacts and encapsulation.

The MCHP High Reliability Surface Mount Resistors are in compliance to DESC drawings 85083 (MCHP 1/8) and 87037 (MCHP 1) and are supplied in accordance to the requirements of MIL-R-55342. Under this specification, all resistors are subjected to "Thermal Shock". Samples are selected from each lot and tested to "TCR", "STOL", "Terminal adhesion", "Solderability", and "Visual" to ensure the lot is in conformance to specified requirements.

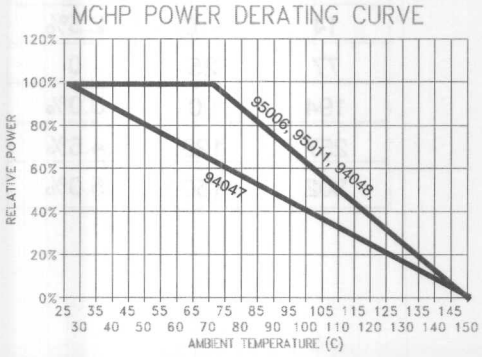
MCHP SPECIFICATIONS:

Size Code[1]	Industry Footprint	IRC Type	DESC Drawing	Rated Power[2] (watts)	Working Voltage[3]	Maximum Voltage	Resistance Range (ohms)	Tolerance (+/-%)	TCR (ppm/C)
B	1206	MCHP1/8	95011[4]	0.125 @ 70°C	200	400	0.1 to 1.0M	1,2,5	100
D	2010	MCHP1/2	94048	0.5@70°C	300	600	0.1 to 1.6K	1,2,5	100
F	2512	MCHP1	95006[5]	1.0 @ 70°C	350	700	0.1 to 2.2 M	1,2,5	100
H	3610	MCHP2	94047	2.0 @ 25C	500	1000	0.2 to 2.2 M	1,2,5	100

[1] See page 8 for product dimensions, recommended solder pads, and standard packaging. [2]For operation above 70°C, use power derating curve. [3]Not to exceed $\sqrt{PxR}$
[4]Formerly 85083 [5]Formerly 87037

MCHP PERFORMANCE CHARACTERISTICS:

Characteristics	Maximum Change	Test Method
Temperature Coefficient	±100 ppm/°C	MIL-R-55342E Par 4.7.9 (-55°C +125°C)
Thermal Shock	± 0.5% +0.01 ohm	MIL-R-55342E Par 4.7.3 (-65°C +150°C, 5 cycles)
Low Temperature Operation	±0.25% +0.01 ohm	MIL-R-55342E Par4.7.4 (-65°C @ working voltage)
Short Time Overload	±0.25% +0.01 o ±1% for R>100K ohm	MIL-R-55342E Par 4.7.5 2.5 x $\sqrt{PxR}$ for 5 seconds
High Temperature Exposure	±0.5% +0.01 ohm	MIL-R-55342E Par 4.7.6 (+150°C for 100 hours)
Resistance to Bonding Exposure	±0.25% +0.01 ohm	MIL-R-55342E Par 4.7.7 (Reflow soldered to board at 260°C for 10 seconds)
Solderability	95% minimum coverage	MIL-STD-202, Method 208 (245°C for 5 seconds)
Moisture Resistance	±0.5% 0.01 ohm	MIL-R-55342E Par 4.7.8 (10 cycles, total 240 hours)
Life Test	±0.5% 0.01 ohm	MIL-R-55342E Par 4.7.10 (2000 hour at 70°C intermittent)
Terminal Adhesion Strength	±1% +0.01 ohm no mechanical damage	1200 gram push from underside of mounted chip for 60 seconds
Resistance to Board Bending	±1% +0.01 ohm no mechanical damage	Chip mounted in center of 90mm long board, deflected 5mm so as to exert pull on chip contacts for 10 seconds



HOW TO ORDER:

Sample Part No.

95011 - 2213 - F - 13

DESC Drawing Number
Resistance Value
(100 ohm & greater-1st 3 significant figures plus 4th digit multiplier)
Example: 100ohms = 1000, 1000ohms=1001, 150,000ohms=1503
(Less than 100ohms - "R" is used to designate decimals)
Examples: 51ohms=51RO, 1.6ohms=1R60, 0.25ohms=R250
Tolerance
(F=1.0%, G=2.0%, J=5.0%)
Packaging Code*
(BLK=Bulk, 7=7"Reel, 13=13"Reel)
*See page 8 for packaging details

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METAL GLAZE™ SURFACE MOUNT TEMPERATURE SENSOR

ISO-9001 Registered

CHPT SERIES (CNTC)

- Negative temperature coefficient (NTC)
- Resistance ratio of 1.33
- Negative 0.25% per °C rate of change (-2500 ppm/°C)
- Superior linearity and curve tolerance
- Metal Glaze™ inherent stability and reliability
- Excellent solderability performance

CHPT SPECIFICATIONS:

Size Code[1]	Industry Footprint	IRC Type	Working Voltage[2]	Maximum Voltage	Resistance Range (ohms)	Tolerance (±%)
B	1206	CNTC 1/8	200	400	500 to 10K	2, 5, 10

[1]See page 8 for product dimensions, recommended solder pads, and standard packaging [2]Not to exceed $\sqrt{PxR}$

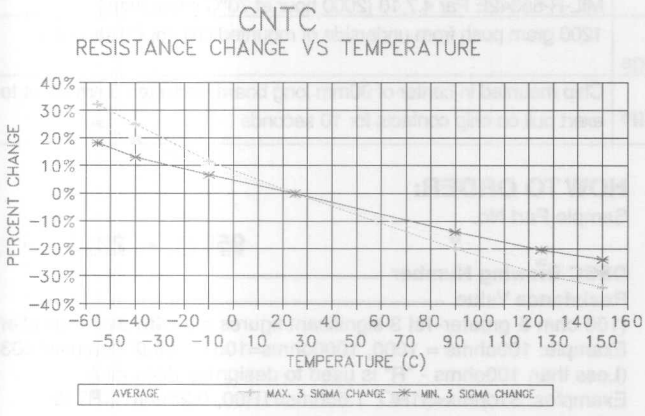
Typical Power Rating*:** 400 milliwatts @ 25°C
Resistance Ratio Characteristic (R25°C / R125°C): 1.33
Operating Temperature Range: -55°C to + 150°C
Curve Linearity: <3% Avg. error from -40°C to + 150°C
<1% Avg. error from -10°C to + 130°C
Typical Dissipation Constant*:** 6 millwatts/°C
Typical Thermal Time Constant*:** 15 seconds

*** Ratings established by mounting resistor on 2"x2" x0.062" thick FR-4 test board.

APPLICATIONS:

The CNTC Thermally Sensitive Resistor is recommended for applications where a need exists to accurately compensate for differences in ambient temperatures, to sense changes in temperature; and to control effects of changes in temperature. It is also recommended for applications where the need exists to sense and react to changes in current within the electrical circuit.

CNTC CURVE TOLERANCE:



CURVE TOLERANCE @ ± 3 SIGMA

Temperature °F	Temperature °C	Curve Tolerance (±)
-67	-55	7.0%
-40	-40	6.0%
14	-10	2.5%
77	25	0
194	90	3.0%
257	125	4.5%
302	150	5.0%

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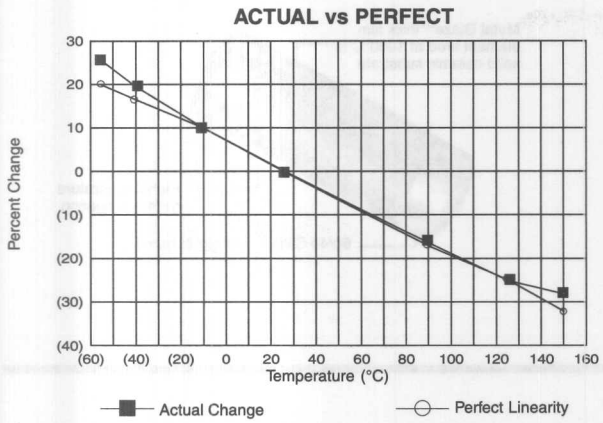
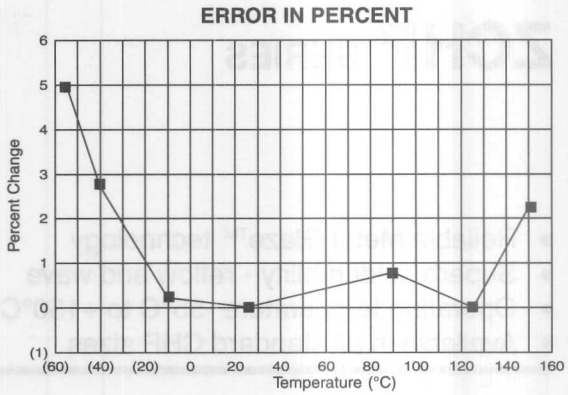
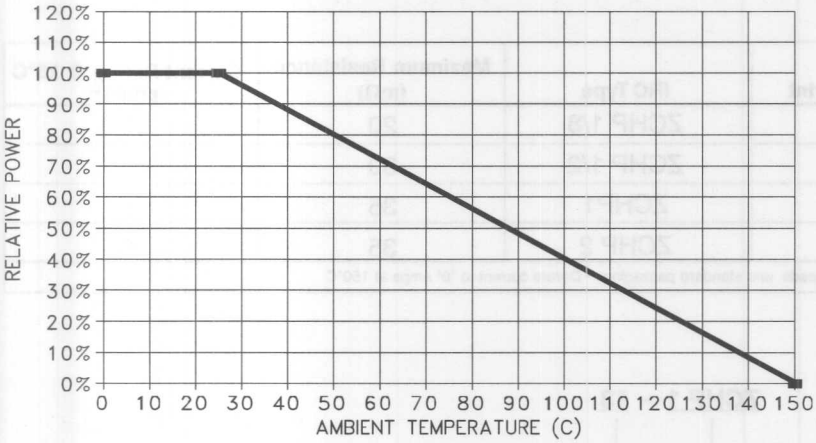
CNTC LINEARITY*:





* Based On Average Change From R25°C to R125°C

CNTC 1/8 POWER DERATING CURVE:



HOW TO ORDER:

Sample Part No.

CNTC 1/8 - 2500 - 1002 - G - 13

IRC Type
CNTC 1/8

Temperature Coefficient
2500

Resistance Value
(100 ohms and greater - First 3 significant figures plus 4th digit multiplier)
Example: 100 ohms = 1000, 1000 ohms = 1001, 150,000 ohms = 1503
(Less than 100 ohms - "R" is used to designate decimal)
Example: 51 ohms = 51R0, 1 ohm = 1R00, 0.25 ohm = R250

Tolerance
G=2%, J=5%, K=10%

Packaging Code*
BLK = Bulk, 7=7" Reel, 13 =13" Reel
*See page 8 for packaging details.

CYLINDRICAL SURFACE MOUNT ZEROHM JUMPERS

ISO-9001 Registered

ZCHP SERIES

- Reliable Metal Glaze™ technology
- Superb solderability - reflow and wave
- Operating temperature -55°C to +150°C
- Available in all standard CHP sizes

APPLICATIONS:

Zerohm Jumpers or Crossovers are basically interconnection devices between points on a PC board. Typically, they are used to connect two points on a PC board due to other circuit paths which must be crossed over. The ZCHP Jumpers are available in four case sizes and are supplied on tape and reel to support high volume placement.

ZCHP SPECIFICATIONS:

Size Code[1]	Industry Footprint	IRC Type	Maximum Resistance (mΩ)	Current Rating @ 25°C (amps)[2]
B	1206	ZCHP 1/8	20	3
D	2010	ZCHP 1/2	30	4
F	2512	ZCHP1	35	5
H	3610	ZCHP 2	35	6

[1] See page 6 for product dimensions, recommended solder pads, and standard packaging. [2] Derate current to "0" amps at 150°C

HOW TO ORDER:

Sample Part No.:

ZCHP 1 - 13

IRC Type
ZCHP 1/8, ZCHP 1/2, ZCHP 1, or ZCHP 2

Packaging Code*
BLK=Bulk, 7=7" Reel, 13=13" Reel
*See page 8 for packaging details.

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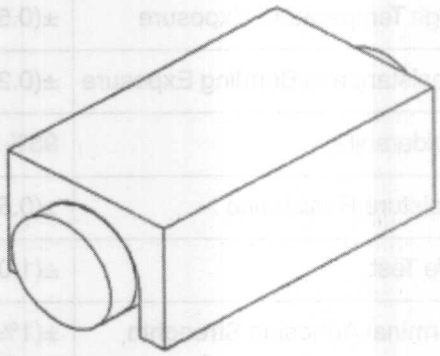
METAL GLAZE™ POWER PACK SURFACE MOUNT HIGH POWER DENSITY CERAMIC PACKAGE

ISO-9001 Registered

IRC

PPS-1 SERIES



- 1 Watt performance - standard 2010 footprint
- Flat ceramic package
- 0.1Ω to 348KΩ range
- Low inductance
- Superior surge handling capability
- 150°C maximum operating temperature
- Flameproof
- Ceramic package provides superior temperature rise profile

PPS-1 SPECIFICATIONS:

Size Code	Industry Footprint	IRC Type	Maximum Power Rating	Working Voltage[1]	Maximum Voltage	Resistance Range (ohms)	Tolerance (±%)[2]	TCR (ppm/°C)[2]
F	2010	PPS-1	1W @ 70°C	350	700	0.1 to 0.99	1, 2, 5	100
						1.0 to 348K	1, 2, 5	50, 100

[1]Not to exceed $(\sqrt{PxR})^{1/2}$. [2]Consult factory for tighter tolerance or TCR.

PPS-1 APPLICATIONS:

The PPS-1 will dissipate 1 watt at 70°C on a 2010 footprint. The PPS-1 is recommended for applications where board real estate or component/board TCE mismatch is a major concern. It is also recommended in circuits where a standard 2010 resistor exhibits marginal or unacceptable performance due to high power density/surge handling demands.

PPS-1 PERFORMANCE CHARACTERISTICS:

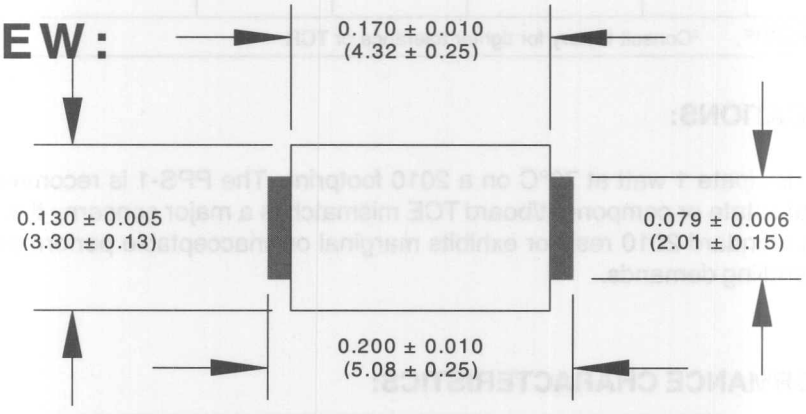
Characteristic	Maximum Change	Test Method
Temperature Coefficient	As specified above	MIL-R-55342E Par 4.7.9 (-55°C +125°C)
Thermal Shock	±(0.5% + 0.01 ohm)	MIL-R-55342E Par 4.7.3 (-65°C +150°C, 5 cycles)
Low Temperature Operation	±(0.25% + 0.01 ohm)	MIL-R-55342E Par 4.7.4 (-65°C @ working voltage)

PPS-1 PERFORMANCE CHARACTERISTICS (continued)

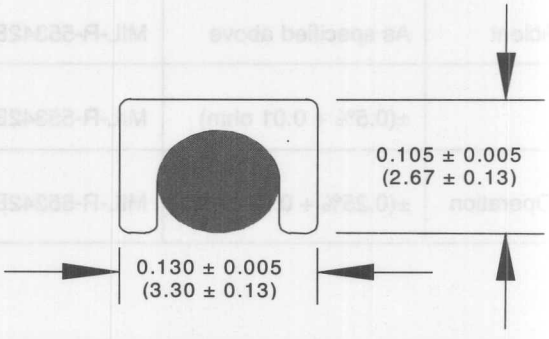
Short Time Overload	±(1.0% + 0.01 ohm)	MIL-R-55342E Par 4.7.5 (2.5 x $(PxR)^{1/2}$
High Temperature Exposure	±(0.5% + 0.01 ohm)	MIL-R-55342E Par 4.7.6 (+150°C for 100 hours
Resistance to Bonding Exposure	±(0.25% + 0.01 ohm)	MIL-R-55342E Par 4.7.7 (Reflow soldered to board at 260°C for 10 sec.)
Solderability	95% minimum coverage	MIL-STD-202, Method 208 (245°C for 5 seconds)
Moisture Resistance	±(0.5% + 0.01 ohm)	MIL-R-55342E Par 4.7.8 (10 cycles, total 240 hrs)
Life Test	±(1.0% + 0.01 ohm)	MIL-R-55342E Par 4.7.10 (2000 hours at 70°C intermittent)
Terminal Adhesion Strenghth	±(1% + 0.01 ohm)	1200 gram push from underside of mounted chip for 60 seconds
Resistance to Board Bending	±(1% + 0.01 ohm)	Chip mounted in center of 90mm long board, deflected 5mm so as t oexert pull on chip contacts for 10 seconds.

PPS-1 DIMENSIONS (Inches and (mm)):

TOP VIEW:



SIDE VIEW:



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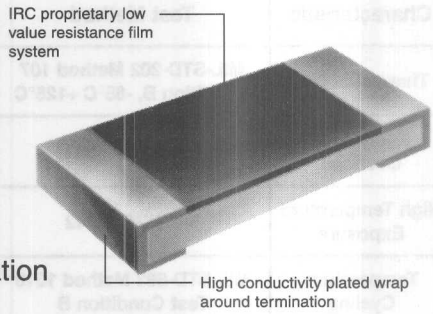
LRC / LRF SERIES



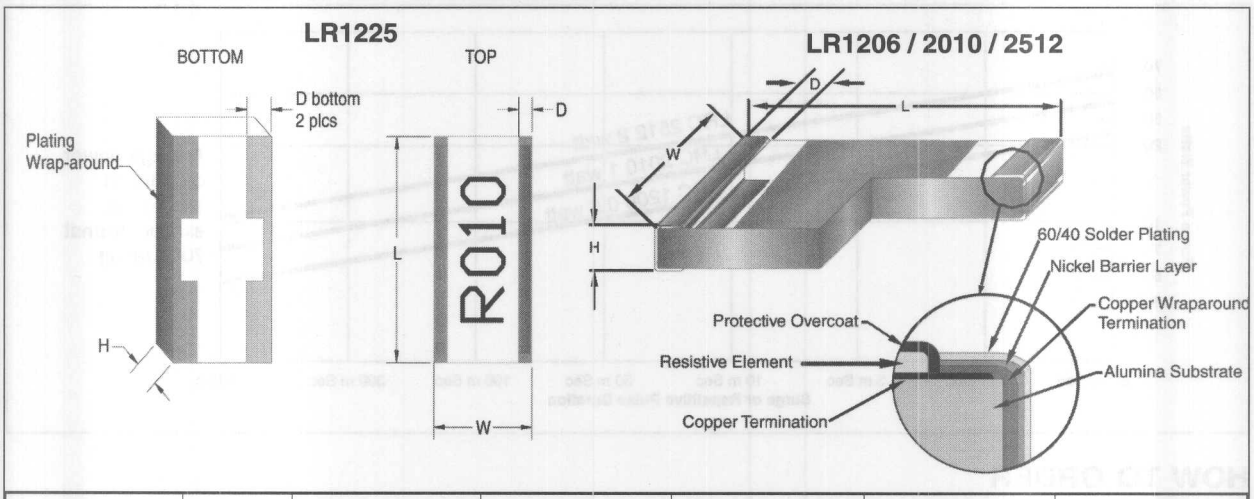
- Standard 2512, 2010 and 1206 sizes
- Resistance values down to 0.003 ohms
- Leach resistant solder-plated copper wrap-around termination
- Low inductance - less than 0.2nH
- Standard EIA Tape - 1206 = 8mm; 2010 or 2512 = 12mm

SPECIFICATIONS:

Model	Resistance Range (Ohms)	TCR (ppm/°C)	Power Rating at 70°C (Watts)	Dielectric Withstanding Voltage	Temperature Rise at Rated Power	Pad and Trace Area for Max Power Rating @ 70°C
LR1206	0.010 to 1	±100 (Contact factory for value below 0.050 ohms)	0.5	200	40°C	30 mm²
LR2010	0.003 to 1		1.0	200	80°C	30 mm²
LR2512	0.003 to 1		1.5 / 2.0*	200	90°C	100 mm²
LR1225	0.003 to 0.10		2.0	200	80°C	200 mm²

* 2 Watts with total solder pad and trace size of 300 mm²

CONSTRUCTION & MECHANICAL DIMENSIONS:



SIZE		L	W	H	D	D bottom
LR1206	in.	0.126 ± 0.012	0.064 ± 0.008	0.024 ± 0.004	0.019 ± 0.010	0.019 ± 0.010
	mm	3.20 ± 0.305	1.63 ± 0.203	0.061 ± 0.102	0.48 ± 0.25	0.48 ± 0.25
LR2010	in.	0.206 ± 0.015	0.104 ± 0.010	0.029 ± 0.004	0.019 ± 0.010	0.019 ± 0.010
	mm	5.23 ± 0.38	2.64 ± 0.25	0.74 ± 0.1	0.48 ± 0.25	0.48 ± 0.25
LR2512	in.	0.256 ± 0.015	0.128 ± .010	0.029 ± 0.004	0.019 ± 0.010	0.019 ± 0.010
	mm.	6.50 ± 0.38	3.25 ± 0.25	0.74 ± 0.1	0.48 ± 0.25	0.48 ± 0.25
LR1225	in.	0.256 ± 0.015	0.128 ± 0.010	0.029 ± 0.004	0.020 ± 0.010	0.031 ± 0.005
	mm.	3.25 ± 0.25	6.5 ± 0.38	0.74 ± 0.1	0.48 ± 0.25	0.79 ± 0.12

ADVANCED FILM DIVISION
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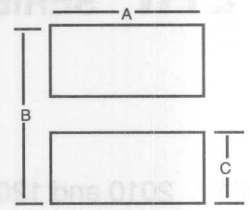
ISO-9001 Registered

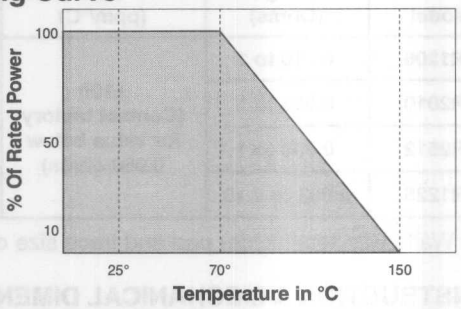
ENVIRONMENTAL PERFORMANCE

Characteristic	Test Method	Performance
Thermal Shock	MIL-STD-202 Method 107 Condition B, -65°C +125°C	±0.5%
Short Time Overload	MIL-PRF-55342	±0.5%
High Temperature Exposure	MIL-PRF-55342	±0.5%
Temperature Cycling	MIL-STD-883 Method 1010 Test Condition B	±0.25%
Moisture	MIL-PRF-55342	±0.5%
Load Life	MIL-PRF-55342 Rated Power @ 70°C	±1.0%
Low Temperature Operation	MIL-PRF-55342	±0.5%
Low Temperature Storage	-65°C, 100 Hours	±0.5%
Resistance to Solder Heat	MIL-STD-202 Method 210	±0.25%
Leach Resistance	Molten Solder 250°C	90 seconds minimum

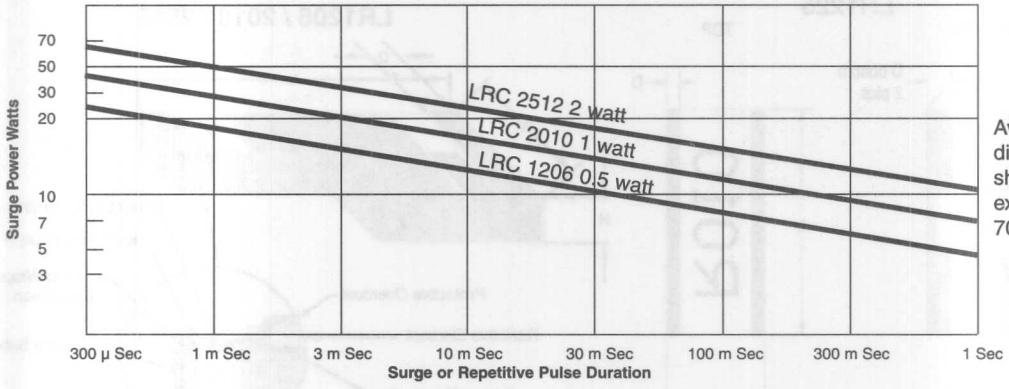


DIM.		LR1206	LR2010	LR2512	LR1225
A	in.	0.080	0.120	0.145	0.305
	mm	(2.0)	(3.05)	(3.7)	(7.75)
B	in.	0.160	0.255	0.305	0.175
	mm	(4.0)	(6.5)	(7.75)	(4.45)
C	in.	0.050	0.060	0.060	0.06
	mm	(1.25)	(1.5)	(1.5)	(1.5)

Derating Curve



Pulse and Surge Capability



Average power dissipation should not exceed normal 70°C rating

HOW TO ORDER

Sample Part Number: LRC - LR 2010 - 01 - R040 - J

MODEL
LR = Resistance ranges above .025 ohm
LRF = Resistance range .025 and below

SIZE:
1206, 2010, 2512, 1225

TCR CHARACTERISTIC
01 = ±100 ppm/°C (Standard)

RESISTANCE CODE
Standard MIL code with "R" signifying decimal place.

TOLERANCE
F = ±1%; G = ±2%; J = ±5%; K = ±10%

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THICK FILM LOW RESISTANCE KELVIN FLIP CHIP

ISO-9001 Registered

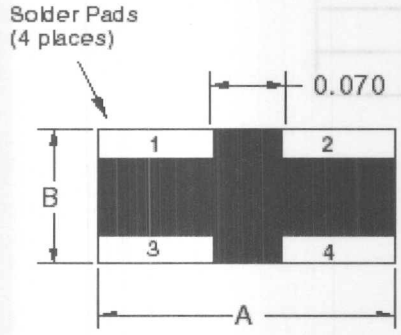
LRK SERIES

- Precision Low Resistance Applications
- Flip Chip Design With Kelvin Layout
- Low Temperature Coefficient
- Resistance to 0.003 ohms
- Tolerances down to ±1.0%
- 2 Watt Power Dissipation @ 70°C

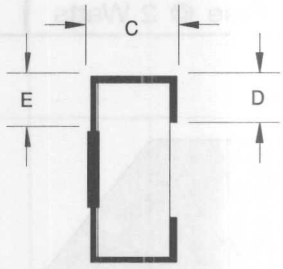
The IRC LRK Low Range Flip Chip Resistor Series offers very low resistance four terminal (Kelvin) layout for applications requiring low cost and precision current measurement. The LRK flip chip utilizes patented, non-noble copper based inks which demonstrate high performance, precision, and reliability.

DIMENSIONS (inches)

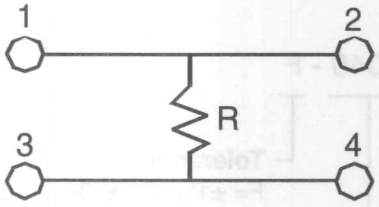
	A	B	C	D	E
Inches	0.256±0.015	0.128±0.010	0.029±0.004	0.020±0.005	0.031±0.007
Millimeters	6.500±0.380	3.250±0.250	0.740±0.100	0.508±0.127	0.787±0.178



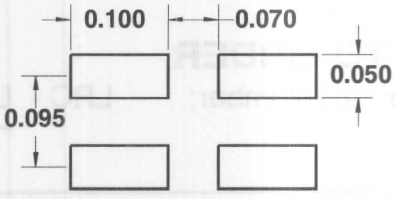
Bottom View



Side View



Schematic Layout



Note: Component power capability is based on operation using 0.060" FR-4 board with adequate pad area.

Recommended Solder Pad Layout

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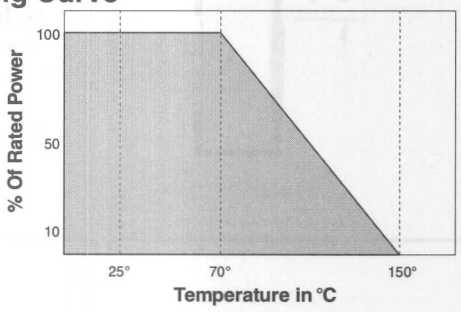
LRK ENVIRONMENTAL PERFORMANCE

TEST CONDITIONS	TEST METHOD	TYPICAL PERFORMANCE
Thermal Shock	MIL-STD 202, Method 107D -55 to 125°C , 5 Cycles 30 Min	±0.5%
Short Time Overload	MIL-PRF-55342	±0.5%
High Temperature Exposure	MIL-PRF-55342 100 Hours @ 125°C	±1.0%
Temperature Cycling	MIL-STD-883 Method 1010 Test Condition B	±0.25%
Moisture Resistance	MIL-STD-202 Method 106E	±0.5%
Load Life	MIL-STD-202 Method 108 Rated Power 1000 Hours @ 70 °C	±1.0%
Low Temperature Operation	MIL-PRF-55342	±0.5%

SPECIFICATIONS

Resistance Range	R003 - R100
Tolerance	to ±1%
Operating Temperature Range	-55 to +150°C
TCR	±100 ppm/°C (down to .010)
Power Dissipation (@70°C)	2.00 Watts
Temperature Rise @ 2 Watts	70°C

Derating Curve



HOW TO ORDER

Sample Part Number: LRC - LRK2512 - 01 - R040 - F

Model
LRK2512

TCR Characteristic
01 = Standard

Tolerance
F= ±1%, G=±2%, J=±5%

Resistance
Standard MIL resistance code
"R" signifies decimal place

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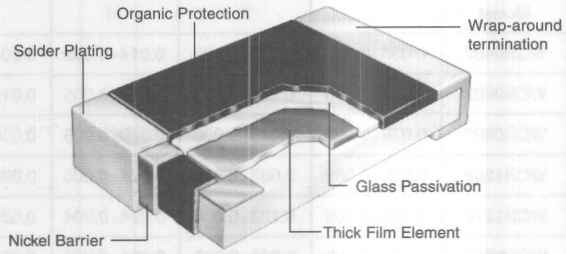
GENERAL PURPOSE THICK FILM CHIP RESISTOR

ISO-9001 Registered

IRC

WCR SERIES



- Wide ohmic range 1 ohm to 22M ohm
- Tolerances to ±0.5%
- TCR down to "50 ppm/°C
- Zero ohm jumpers available

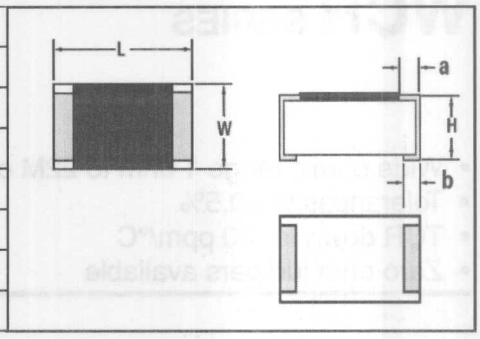
SPECIFICATIONS

P/N	TCR (ppm/°C)	Ohmic Range (Ω)				Rated Power at 70°C (milliwatts)	Max Working Voltage	Max Overload Voltage	Packaging	
		±5%	±2%	±1%	±0.5%				Carrier Tape	Qty
WCR0402	±200	10R-1M	N/A	N/A	N/A	50	25	50	Card-board	10,000
	±100	N/A	N/A	10R-1M	N/A					
	±50	N/A	N/A	N/A	100R-1M					
WCR0603	±400	1R0-9R1,1M1-10M	N/A	N/A	N/A	62.5	50	100	Card-board	5,000
	±200	10R-1M	N/A	N/A	N/A					
	±100	N/A	10R-1M	10R-1M	N/A					
	±50	N/A	N/A	N/A	10R-1M					
WCR0805	±400	1R0-9R1,6M2-22M	N/A	1R0-9R76,1M1-10M	N/A	100	150	200	Card-board	5,000
	±200	10R-5.6M	10R-1M	N/A	N/A					
	±100	N/A	N/A	10R-1M	N/A					
	±50	N/A	N/A	N/A	10R-1M					
WCR1206	±400	1R0-9R1,6M2-22M	N/A	1R0-9R76,1M1-10M	N/A	250	200	400	Card-board	5,000
	±200	10R-5M6	10R-1M	N/A	N/A					
	±100	N/A	N/A	10R-1M	N/A					
	±50	N/A	N/A	N/A	10R-1M					
WCR1210	±400	1R0-9R1,1M1-10M	N/A	1R0-9R76,1M1-10M	N/A	250	200	400	Plastic	4,000
	±200	10R-1M	10R-1M	N/A	N/A					
	±100	N/A	N/A	10R-1M	10R-976K					
WCR2010	±400	1R0-9R1,6M2-22M	N/A	1R0-9R76,1M1-10M	N/A	500	200	400	Plastic	4,000
	±200	10R-5M6	10R-1M	N/A	N/A					
	±100	N/A	N/A	10R-1M	N/A					
	±50	N/A	N/A	N/A	10R-976K					
WCR2512	±400	1R0-9R1,6M2-22M	N/A	1R0-9R76,1M1-10M	N/A	1000	200	400	Plastic	4,000
	±200	10R-5M6	10R-1M	N/A	N/A					
	±100	N/A	N/A	10R-1M	N/A					
	±50	N/A	N/A	N/A	10R-976K					

ISO-9001 Registered

DIMENSIONS (inches)

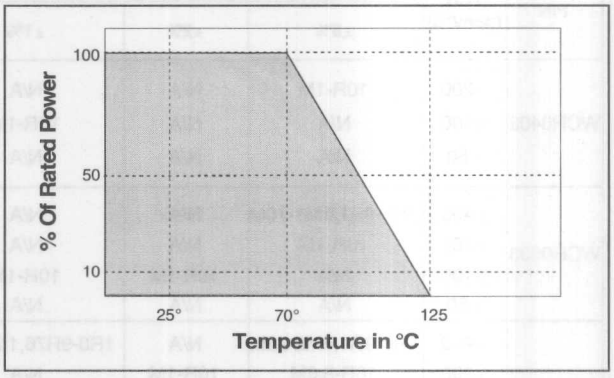
Model	L	W	H	a	b
WCR0402	0.039±0.002	0.020±0.002	0.014±0.002	0.008±0.004	0.010±0.002
WCR0603	0.063±0.008	0.032±0.008	0.020±0.005	0.012±0.009	0.012±0.009
WCR0805	0.079±0.008	0.049±0.008	0.020±0.005	0.016±0.009	0.012±0.009
WCR1206	0.125±0.009	0.063±0.008	0.024±0.005	0.020±0.013	0.016±0.009
WCR1210	0.126±0.008	0.102±0.008	0.024±0.004	0.020±0.012	0.016±0.008
WCR2010	0.197±0.008	0.098±0.008	0.024±0.004	0.020±0.012	0.016±0.008
WCR2512	0.248±0.008	0.122±0.008	0.024±0.004	0.020±0.012	0.016±0.008



ENVIRONMENTAL PERFORMANCE

Test Conditions	Test Method	Max Change (5%)	Max Change (1%)
Short Time Overload	5 Seconds 2.5 X Rated Power	±2.0%	±0.75%
Temperature Cycling	5 Cycles -55°C to +125°C	±0.5%	±0.5%
Humidity	1000 Hours 40°C ±2°C 90-95% RH	±3.0%	±1.0%
Load Life	1000 Hours 70°C ±3°C	±3.0%	±1.0%
High Temperature Exposure	1000 Hours 125°C ±3°C	±1.0%	±1.0%
Low Temperature Exposure	1000 Hours -55°C ±3°C	±1.0%	±1.0%
Effects of Solder Heat	10 ±1 Seconds 260°C ±5°C	±1.0%	±0.75%
Solderability	3 ±0.5 Seconds 235°C ±5°C	95% Min Coverage	95% Min Coverage

POWER DERATING CHART



HOW TO ORDER

Sample Part Number: WCR - WCR1206 - 1001 - F - P - LT

Model
WCR0402, WCR0603, WCR0805,
WCR1206, WCR1210,WCR2010,WCR2512

Resistance
3-digit resistance code for tolerances G and J.
4-digit resistance code for tolerances F and D.

Tape & Reel Packaging

Tape Type
(P=Paper, E=Plastic)

Tolerance
J=±5%, G=±2%, F=±1, D=±0.5%

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THICK FILM RESISTOR ARRAY

ISO-9001 Registered

WCA SERIES

- 8 Terminal Package With 4 Isolated Resistors
- Automatic Placement Capabilities
- Operating Temperature -55°C to +125°C
- Wrap-Around Terminations

SPECIFICATIONS

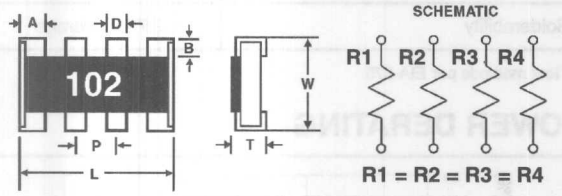
Resistance Range	10 ohm - 1 Megohm zero ohm jumper
Tolerance	±5%
Operating Temperature Range	-55°C to +125°C
Temperature Coefficient	±200 ppm/°C
Power Dissipation (@70°C)	.063 Watts
Maximum Working Voltage	50 Volts

ENVIRONMENTAL PERFORMANCE*

TEST	MAXIMUM ΔR
Thermal Shock	±1.0%
Short Time Overload	±1.0%
High Temperature Exposure	±3.0%
Resistance to Solder Heat	±1.0%
Moisture Resistance	±2.0%
Load Life	±3.0%
Low Temperature Operation	±0.5%
Solderability	95% Coverage

*Test methods per EIA-575

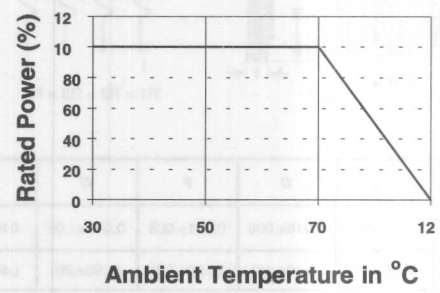
DIMENSIONS



L	A	B	D	P	W	T
0.126±.008	0.024±.006	0.012±.008	0.016±.006	0.031±.008	0.063±.008	.016±.004
(3.20± .20)	(0.60±.15)	(0.30±.20)	(0.40±.15)	(0.80±.20)	(1.60±.20)	(0.40±.10)

Note: Numbers in ( ) indicate millimeters.

POWER DERATING



HOW TO ORDER

Sample Part Number: WCA - WCA - 08 - 04 - 102 - J - PLT

MODEL
WCA

TERMINAL COUNT
08 = 8 Pins

RESISTOR COUNT
04 = 4 Isolated Resistor

PACKAGING
P=Paper Tape, Tape & Reel (5000/reel)

TOLERANCE
J = ±5%

RESISTANCE VALUE
Three digit resistance code
Example: 102 = 1,000 ohms

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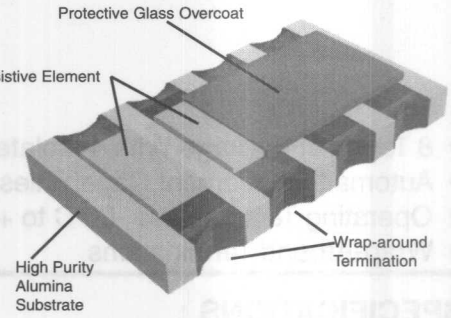
THICK FILM RESISTOR ARRAY

ISO-9001 Registered

WCC SERIES



- Improved Placement Efficiency Over Flat Chip Resistors
- Non-leaching Nickel Barrier Wrap-around Terminations
- Monolithic Construction
- Concave Termination Style

SPECIFICATIONS

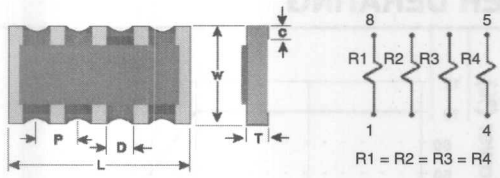
Resistance Range	10 ohm - 1 Megohm zero ohm jumper
Tolerance	±1% and ±5%
Operating Temperature Range	-55°C to +125°C
Temperature Coefficient	±200 ppm/°C
Power Dissipation (@70°C)	.063 Watts
Maximum Working Voltage	50 Volts

ENVIRONMENTAL PERFORMANCE

TEST*	MAXIMUM ΔR
Thermal Shock	±1.0%
Short Time Overload	±1.0%
High Temperature Exposure	±3.0%
Resistance to Solder Heat	±1.0%
Moisture Resistance	±2.0%
Load Life	±3.0%
Low Temperature Operation	±0.5%
Solderability	95% Coverage

*Test methods per EIA-575

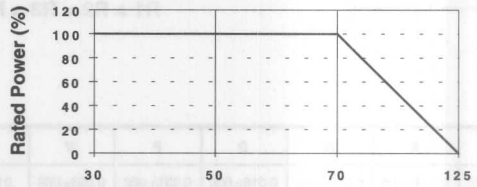
DIMENSIONS



L	C	D	P	W	T
0.126±.008	0.018±.004	0.016±.006	0.031±.008	0.063±.008	.016±.004
(3.20± .20)	(0.45±.10)	(0.40±.15)	(0.80±.20)	(1.60±.20)	(.40±.10)

Note: Numbers in ( ) indicate millimeters.

POWER DERATING



HOW TO ORDER

Sample Part Number: WCA - WCC 08 04 - 102 - J - PLT

FAMILY

MODEL
WCC

TERMINAL COUNT
08 = 8 Pins

RESISTOR COUNT
04 = 4 Isolated Resistors

RESISTANCE VALUE
First 2 significant digits plus third digit multiplier
Example: 102 = 1,000 ohms

TOLERANCE
F = ±1%, J = ±5%

PACKAGING
P = Paper Tape, Tape & Reel (5000 per Reel)

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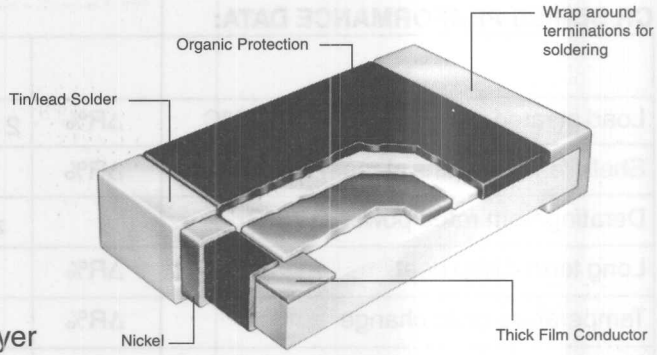
SURFACE MOUNT RESISTOR

ISO-9001 Registered

IRC

CR SERIES



- 0 ohm available
- 1.0 ohms to 100M ohms
- 0 ohms available also
- Tolerance down to 0.25%
- Solder terminations have a nickel barrier layer
- Shorting links available
- Any resistance value available within specified range

SPECIFICATIONS:

IRC type	Power Rating At 70°C (watts)	Resistance Range (ohms) 5% Tol.	2% Tol.	1% Tol.	0.5% Tol.	0.25% Tol.	Limiting Element Voltage (volts)	TCR -55°C to +125°C (ppm/°C)	Values	Thermal Impedance** (°C/watt)	Operating Temp. Range (°C)
CR0503	0.063	1-10M	1-10M	10-10M	100-1M	N/A	50	<10Ω 350; 10 to 100Ω 200; 100 to 1MΩ 100: >1MΩ 250	E24 & E96 preferred (any value to order)	800	-55 to 125
CR0805	0.1	1-100M	1-50M	1-20M	1-10M	100-1M	100			360	
CR1005	0.125	1-100M	1-50M	1-20M	1-10M	100-1M	150			290	
CR1206	0.25	1-100M	1-50M	1-25M	1-10M	100-1M	200			200	

*For 10 devices mounted on 50x25mm p.c.b. area. ** Zerohm is available.

Construction:
Thick film resistor material, overglaze and organic protection are screen printed on a 96% alumina substrate.

Terminations:
Wrap-around terminations on CR resistors have good 'leach' resistance properties. They will withstand immersion in solder at 260°C for 30 seconds.

Marking:
All relevant information is recorded on the primary package or reel.

Thickness:
The thickness of these devices depend on the size of the chip. The table below shows the standard substrate thickness used. (mm)

STYLE	0503	0805	1005	1206
Planar	0.63	0.4	0.63	0.5
Wrap-around	N/A	0.4	N/A	0.5

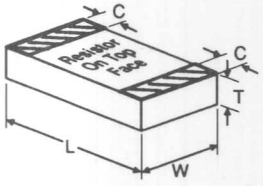
F = wrap around; G = planar gold.

DIMENSIONS (Inches and (mm)):

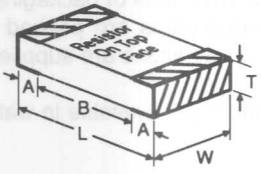
Style	L	W	T	Wrap Around A	Wrap Around B*	Planar C	Weight (g)
0503	.049±.008 (1.25±0.2)	.025±.006 (.063±0.15)	.027 (.07)	not available		.008±.004 (0.2±0.1)	0.005
0805	.079±.012 (2.0±0.3)	.049±.008 (1.25±0.2)	0.27 (.07)	.012±.006 (0.3±0.15)	.035 (0.9min)	.012±.004 (0.3±0.1)	0.009
1005	.098±.012 (2.5±0.3)	.049±.008 (1.25±0.2)	.027 (.07)	not available		.016±.006 (0.4±0.15)	0.015
1206	.126±.016 (3.2±0.4)	.063±.008 (1.6±0.2)	.027 (.07)	.016±.008 (0.4±0.2)	.067 (1.7min)	.016±.006 (0.4±0.15)	0.020

* This dimension determines the number of conductors which may pass under the surface mounted device.

Planar Terminations



Wrap Around Terminations (3 Faces)



ISO-9001 Registered

IRC

CR SERIES PERFORMANCE DATA:

		Requirements	Actual	
			Maximum	Typical
Load at rated power: 1000 hrs at 70°C	ΔR%	2 (5 above 3M3)	1	0.25
Shelf life: 12 months at room temperature	ΔR%			0.1
Derating from rated power at 70°C		zero at 125°C		
Long term damp heat	ΔR%	2	1	0.25
Temperature rapid change	ΔR%	1	0.25	
Resistance to solder heat	ΔR%	2.5	0.25	
Voltage proof	volts		500	

APPLICATION NOTES:

Mounting

This chip resistor is ideally suited for handling by automatic methods due to its rectangular shape and the small dimensional tolerances. Electrical connection to a ceramic substrate or to a printed circuit board can be made by reflow soldering of wrap-around terminations (eg suffix 'F' in CR0805F). The 'F' terminations provide good leach properties and ensure reliable contact. Due to the robust construction, the resistor chip can be immersed completely in the solder bath for 30 seconds at 260°C. This enables the resistor to be mounted on one side of a printed circuit board and other wire-leaded components on the other side.

HOW TO ORDER :

Specify type, reference, etc. as indicated in this example of a CR0805F 8.2M ohms 5% resistor with wrap around terminations and packed in a plastic bag.

Sample Part No.:

CR 0805 F 8M2 J P

Type

Style

Termination
(F= Wrap Around, P= Planar)

Value

Tolerance
(C= 0.25%, D= 0.5%, F= 1.0%, G= 2.0%, J= 5.0%)

***Packaging**
(T= Tape Pack (8mm tape), W= Waffle Pack, P= Plastic Bag)

*The preferred methods of packaging are:
Gold terminated chips are packed in waffle boxes, chips with wraparound terminations are supplied tape & reel on .8mm tape.

Note:0503 and 1005 available in waffle package only.

WIREWOUND AND FILM TECHNOLOGIES DIVISION
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HIGH VALUE SURFACE MOUNT RESISTOR

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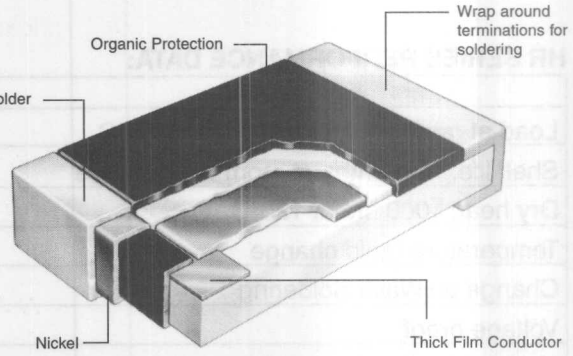
IRC

HR SERIES



- 100M ohms to 50G ohms
- Low voltage coefficient of resistance

SPECIFICATIONS:

IRC Type	Resistance Range (ohms) (measured at 10 volts)	Limiting Element Voltage (volts)	Operating Temperature Range (°C)	TCR (ppm/°C) (measured at 10 volts)	Resistance Tolerance (%)
0805	100M to 50G	100	-55 to +125	0 to -2000	100M to 1G: 5, 10
1005	100M to 50G	150	-55 to +125	0 to -1500	>1G to 50G: 25, 50
1206	100M to 50G	200	-55 to +125	0 to -1000	

Power Rating:
The high resistance value of these devices is such that power dissipation is always small. The rating is therefore determined by voltage considerations only, as shown in the table above.

Construction:
The resistor material is screen printed onto a 96% alumina substrate and covered with a protection comprising of a glaze followed by an organic coating. This construction gives an insulated device.

Terminations:
Wrap-around terminations on HR resistors have good 'leach' resistance properties. They will withstand immersion in solder at 260°C for 30 seconds.

Marking:
All relevant information is recorded on the primary package or reel.

Thickness:
The thickness of these devices depend on the size of the chip. The table below shows the standard substrate thickness used. (mm)

STYLE	0503	0805	1005	1206
Planar	0.63	0.4	0.63	0.5
Wrap-around	N/A	0.4	N/A	0.5

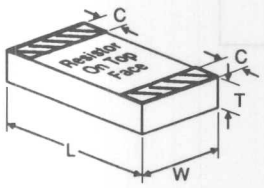
F = wrap around; G = planar gold.

DIMENSIONS (Inches and (mm)):

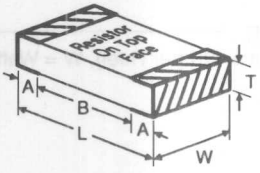
Style	L	W	T	Wrap Around A	Wrap Around B*	Planar C	Weight (g)
0805	.079±.012 (2.0±0.3)	.049±.008 (1.25±0.2)	0.27 (.07)	.012±.006 (0.3±0.15)	.035 (0.9min)	.012±.004 (0.3±0.1)	0.009
1005	.098±.012 (2.5±0.3)	.049±.008 (1.25±0.2)	.027 (.07)	not available		.016±.006 (0.4±0.15)	0.015
1206	.126±.016 (3.2±0.4)	.063±.008 (1.6±0.2)	.027 (.07)	.016±.008 (0.4±0.2)	.067 (1.7min)	.016±.006 (0.4±0.15)	0.020

* This dimension determines the number of conductors which may pass under the surface mounted device.

Planar Terminations



Wrap Around Terminations (3 Faces)



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HR SERIES PERFORMANCE DATA:

		Maximum	Typical
Load at rated voltage: 1000 hrs at 70°C	ΔR%	2	1
Shelf life: 12 months at room temperature	ΔR%	2	1
Dry heat: 1000 hrs at 125°C	ΔR%	2	0.5
Temperature rapid change	ΔR%	1	0.3
Change on Wave Soldering	ΔR%	1	0.5
Voltage proof	volts	100	200
Voltage coefficient of resistance	%volts		
(10V - 25V)	0805	1.0	0.4
	1005	0.8	0.3
	1206	0.2	0.05

APPLICATION NOTES:

Mounting

This chip resistor is ideally suited for handling by automatic methods due to its rectangular shape and the small dimensional tolerances. Electrical connection to a ceramic substrate or to a printed circuit board can be made by reflow soldering of wrap-around terminations. The 'F' terminations provide good leach properties and ensure reliable contact. Due to the robust construction the resistor chip can be immersed completely in the solder bath for 30 seconds at 260°C. This enables the resistor to be mounted on one side of a printed circuit board and other wire-leaded components on the other side. The presence of moisture will not damage the resistor in any way.

HOW TO ORDER

Specify type reference etc. as indicated in this example of a HR0805F 100M ohms 5% resistor with wrap around terminations and packed in a waffle pack. 1005 is available in Waffle Pack only.

Sample Part No.:

HR 0805 F 100M J W

Type

Style

Termination
(F = Wrap Around, G = Planar Gold)

Value

Tolerance
(J = 5%, K = 10%, S = 25%, Y = 50%)

Packaging
(T = Tape Pack (3K per Reel), W = Waffle Pack)

WIREWOUND AND FILM TECHNOLOGIES DIVISION
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TANFILM® PRECISION CHIP RESISTORS

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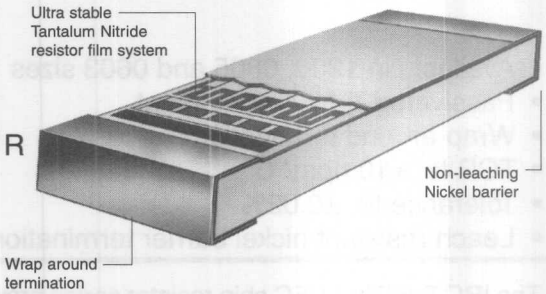
PFC MILITARY SERIES



- Qualified to MIL-PRF-55342, Char. E, H, K, and M
- Qualified to MIL-PRF-55342 Failure Rates M, P and R
- Passivated TaNFilm® element
- Wrap-around termination
- TCR to ±25 ppm/°C
- Tolerance to ±0.1%
- Leach-resistant nickel barrier termination

The IRC TaNFilm® Precision Chip Resistor provides high temperature and ultra stable performance in standard 0805 and 1206 sizes. Solder coated wrap-around terminations with leach-resistant nickel barrier insure high integrity solder connections.

The unique characteristics of the self-passivated, Tantalum Nitride resistor film insure long term life stability and moisture resistance easily surpassing the MIL-PRF-55342 requirements. Standard packaging is 8mm plastic tape per EIA 481. Conductive waffle pack packaging is also available.

For your most environmentally demanding applications, specify IRC PFC MIL qualified chip resistors.

SPECIFICATIONS

Characteristic		W0805	W1206
Resistance Range (Ω)	±1% - ±5%	10 - 125K	10 - 125K
	±0.1%	100 - 125K	100 - 125K
Power Rating	Char. E and H	50mW	125 mW
	Char. K and M	100 mW	250 mW
Maximum Voltage Rating		50 volts	100 volts
Operating Temperature Range		-65°C to +150°C	
Noise		Less than -25 db	
Termination		Solder over nickel	

ENVIRONMENTAL

Environmental Test MIL-PRF-55342	Max. ΔR per Char. E	Performance Typical	Performance Max.
Thermal Shock	±0.10%	±0.02%	±0.10%
Low Temperature Operation	±0.10%	±0.01%	±0.05%
Short Time Overload	±0.10%	±0.01%	±0.05%
High Temperature Exposure	±0.10%	±0.03%	±0.10%
Effects of Solder	±0.20%	±0.01%	±0.10%
Moisture Resistance	±0.20%	±0.03%	±0.10%
Life	±0.50%	±0.03%	±0.10%

HOW TO ORDER

Sample Part Number: PFC - W1206 R - 06 - 1001 - B

Model
W1206 - MIL-R-55342/07 Style RM1206
W0805 - MIL-R-55342/06 Style RM0705

Terminal Designator
R= Solder Coated Type B Termination

TCR Characteristic
04 = ±300 ppm/°C, 05 = ±100 ppm/°C, 06 = ±50 ppm/°C, 07 = ±25 ppm/°C

Tolerance
B=±0.1%, F=±1%, G=±2%
J=±5%, K=±10%

Resistance
Standard 4-digit MIL Resistance Code
Examples: 1203 = 120KΩ, 51R0 = 51Ω

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TANFILM® PRECISION CHIP RESISTORS

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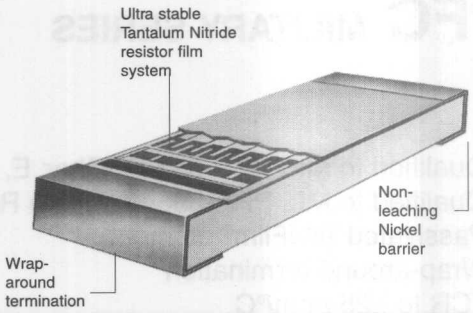
PFC COMMERCIAL SERIES

- Available in 1206, 0805 and 0603 sizes
- Passivated TaNFilm® element
- Wrap-around termination
- TCR to ±10 ppm/°C
- Tolerance to ±0.02%
- Leach resistant nickel barrier termination



The IRC TaNFilm® PFC chip resistor series provides the high temperature and ultra stable performance of our Tantalum Nitride Resistive Film System in 1206, 0805 and 0603 sizes. The unique characteristics of the passivated Tantalum Nitride film insure long term life stability.

Using the same manufacturing line as our Military Series, IRC's PFCs maintain the same superior environmental performance. Specially selected materials and processes insure initial precision is maintained in the harshest surface mount soldering environment. Solder coated wrap-around terminations with leach-resistant nickel barriers insure high integrity solder connections.

SPECIFICATIONS:

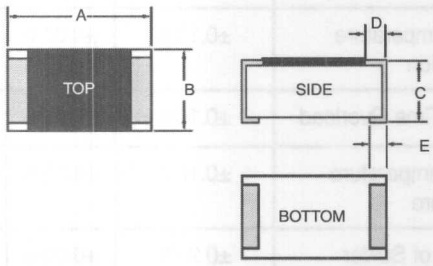
Characteristic	W0603	W0805	W1206
Power Rating	62.5 mW	100mW	250mW
Maximum Voltage Rating	75 volts	100 volts	200 volts
Operating Temperature Range	-65°C to +150°C		
Noise	Less than -25 dB		
Substrate	High purity alumina		

TCR AND TOLERANCE LIMITS:

	W0603		W0805		W1206	
Range (ohms)	TCR (ppm/°C)	Tol (%)	TCR (ppm/°C)	Tol (%)	TCR (ppm/°C)	Tol (%)
5Ω - 10Ω	50	0.5	50	0.5	50	0.5
10.1Ω - 50Ω	25	0.1	25	0.1	25	0.1
50.1Ω - 200Ω	25	0.05	10	0.05	10	0.05
201Ω - 25.0KΩ	25	0.05	15	0.02	15	0.02
			10	0.05	10	0.05
25.1KΩ - 50KΩ	25	0.05	15	0.02	15	0.02
			10	0.05	10	0.05
50.1KΩ - 100 Ω	N/A		15	0.02	15	0.02
			10	0.05	10	0.05
101KΩ - 267 Ω	N/A		25	0.05	15	0.02
					10	0.05
268KΩ - 1.00MΩ	N/A		N/A		15	0.05

Consult Factory for values, TCRs, and tolerances outside this table.

DIMENSIONS (Inches):



Model	A	B	C	D	E
W0603	0.063±0.004	0.031±0.004	0.020±0.004	0.008±0.004	0.008±0.004
W0805	0.081±0.005	0.050±0.005	0.020±0.006	0.016±0.008	0.016±0.008
W1206	0.126±0.006	0.063±0.005	0.024±0.004	0.016±0.008	0.016±0.008

HOW TO ORDER

Sample Part Number: PFC - W1206 R - 03 - 1001 - B

Model
W1206, W0805, W0603

Terminal Designator
R= Solder Coated Type B Termination

TCR Characteristic
01 = ±100 ppm/°C, 02 = ±50 ppm/°C, 03 = ±25 ppm/°C
10 = ±20 ppm/°C, 11 = ±15 ppm/°C, 12 = ±10 ppm/°C

Tolerance
Q=±0.02%, A=±0.05%, B=±0.1%
D=±0.5%, F=±1%, G=±2%

Resistance
Standard 4-digit resistance code
Examples: 2003 = 200KΩ, 51R0 = 51Ω

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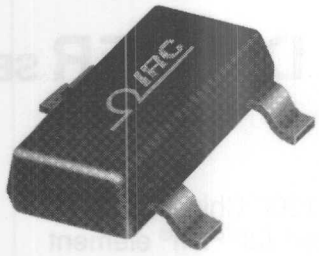
SURFACE MOUNT DIVIDER NETWORK

ISO-9001 Registered

IRC

SOT SERIES



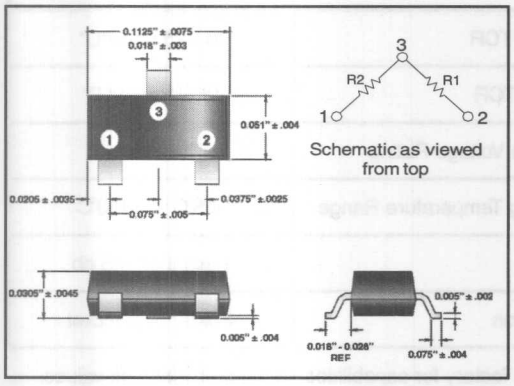
- Ultra-stable TaNSil® resistors on silicon
- Reliable, no internal cavity
- Low cost, highly reliable, wire bonded package
- Small footprint, less than .025 square inches

IRC's TaNSil® SOT resistor networks are ideally suited for low cost divider applications that demand precision performance in a small printed wiring board footprint. Available in a SOT23 package, it is fully compatible with the latest surface mount assembly techniques. Compliant gull wing leads relieve thermal expansion and contraction stresses created by soldering and temperature excursions.

The tantalum nitride film system on silicon provides precision tolerance, exceptional TCR tracking and miniature physical dimensions. Excellent performance in harsh, humid environments is a trademark of IRC's self-passivating, TaNSil® resistor film.

For applications requiring high performance resistor dividers in a surface mount package, specify IRC SOT series resistors.

DIMENSIONS



ENVIRONMENTAL PERFORMANCE TO MIL-PRF-83401			
TEST	CHARACTERISTIC H Δ LIMIT	MAX ΔR	TYPICAL ΔR
Thermal Shock	0.5	0.1	0.02
Power Conditioning	0.5	0.1	0.03
Low temperature Operation	0.1	0.1	0.03
Short Time Overload	0.1	0.1	0.02
Terminal Strength	0.25	0.1	0.02
Resistance to Solder Heat	0.1	0.1	0.02
Moisture Resistance	0.4	0.1	0.03
Shock	0.25	0.1	0.02
Vibration	0.25	0.1	0.02
Life	0.5	0.1	0.05
High Temperature Exposure	0.2	0.1	0.05
Low Temperature Storage	0.1	0.05	0.03
25% Double Load	0.5	0.1	0.05

SPECIFICATIONS

Resistance Range (Ω)	Absolute Tolerance	Ratio Tolerance	Absolute TCR (ppm/°C)	Tracking TCR (ppm/°C)	Operating Temperature Range (°C)	Maximum Operating Voltage	Noise	Substrate	Package Power Rating
10 to 100K per resistor	to ±.1%	to ±.1%	to ±25	to ±5	-55 to +125	100 V or $\sqrt{P \times R}$	<-25dB	Silicon	0.25W

HOW TO ORDER:

Sample Part Number: **SOT - SOT23 - 03 - 1002 - 5001 - F B**

Style

TCR Code (ppm/°C)
01=±100, 02=±50, 03=±25

R1 Resistance Code
4 digit military resistance code.
Ex: 1001 = 1000Ω, 1003 = 100,000Ω

R2 Resistance Code

Absolute Tolerance Code
F=1%; C=0.25%; B=0.1%

Ratio Tolerance Code
F=1%; C=0.25%; B=0.1%

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TANFILM® PRECISION CHIP VOLTAGE DIVIDER

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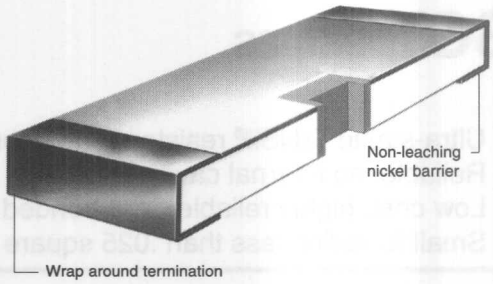
PFC DIVIDER SERIES



- Popular 1206 Chip Size
- Passivated TaNFilm® element
- 5Ω to 100KΩ per resistor
- Replaces matched sets
- Saves precious board space
- Leach resistant nickel barrier termination

IRC now has a perfect voltage divider solution. Designed around the 1206 sized chip, the PFC Divider series provides a single package solution that is compatible with your automatic placement equipment. The ratio tolerance can be specified down to 0.05% which is much tighter than the 0.2% achievable from two individual 0.1% chip resistors. Similarly, the TCR tracking of 5 ppm/°C is far superior to the tracking obtainable from two individual 25 ppm chip resistors. IRC's TaNFilm® Tantalum Nitride film system provides superior environmental performance while insuring long term life stability.

This dual element, monolithic package offers the advantages of reducing component quantities and board space while increasing quality and reliability.

For a precision voltage divider network in a small package solution, specify IRC TaNFilm® PFC Dividers.

SPECIFICATIONS

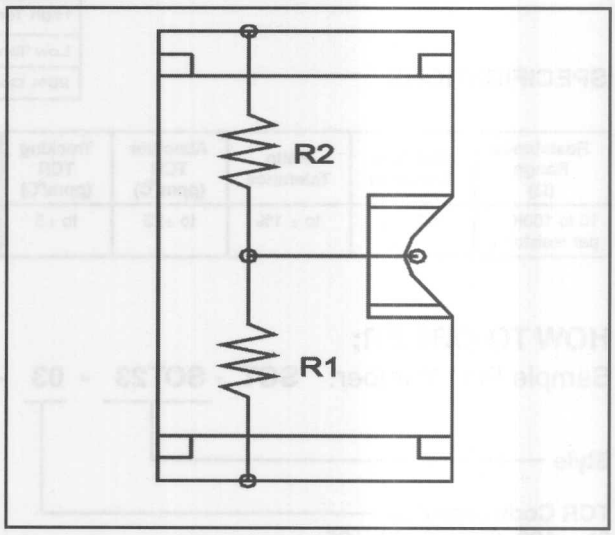
Characteristic	Per Resistor	Package
Resistance Range (Ω)	5 - 125K	10 - 200K
Power Rating	125mW	250mW
Absolute TCR	to ±25 ppm/°C*	
Tracking TCR	to ±5 ppm/°C*	
Maximum Voltage Rating	100 volts	
Operating Temperature Range	-65°C to +150°C	
Noise	Less than -25 db	
Termination	Solder over nickel	

* Contact factory for capabilities based on resistance values.

ENVIRONMENTAL PERFORMANCE:

Test	Method	ΔR/R	ΔRatio
Thermal Shock	MIL-STD-202 -65 to +125°C, 5 Cycles	±.02%	±.005%
Short Time Overload	MIL-PRF-55342	±.02%	±.005%
High Temperature Exposure	MIL-PRF-55342	±.03%	±.01%
Resistance to Bond Exposure	MIL-PRF-55342	±.01%	±.01%
Moisture Resistance	MIL-STD-202 10 Cycles, 240 hours	±.03%	±.02%
Load Life (Rated Power)	MIL-STD-202 70°C, 1000 hours	±.03%	±.01%
Low Temperature Operation	MIL-PRF-55342	±.01%	±.005%

SCHEMATIC (View from top)



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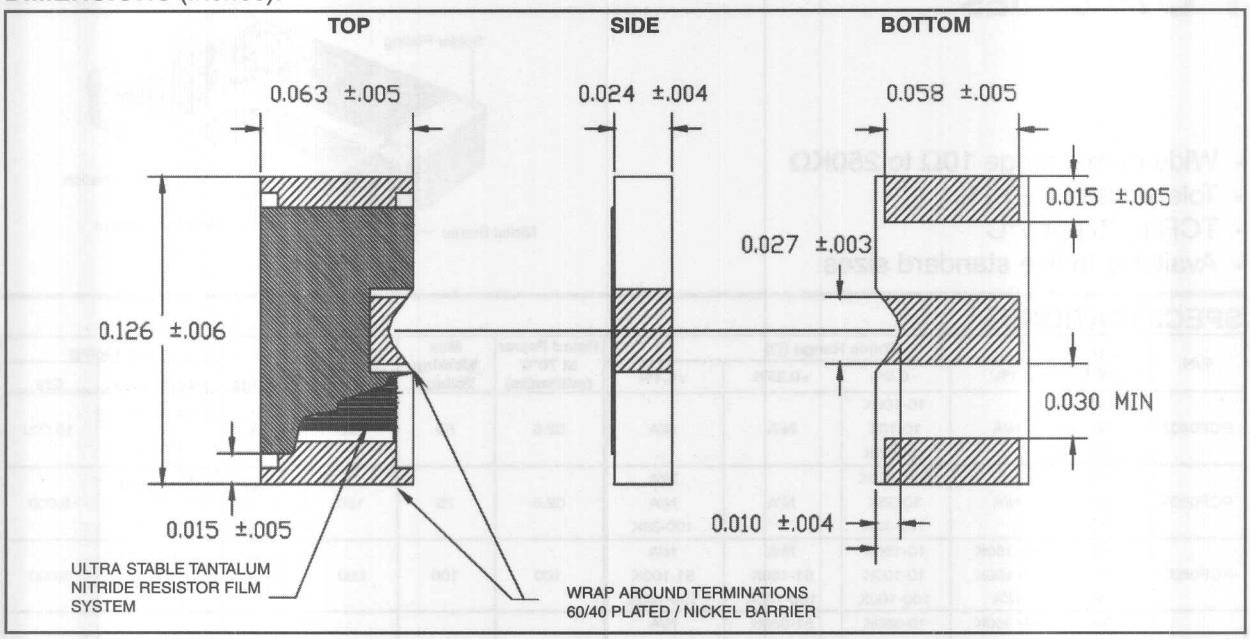
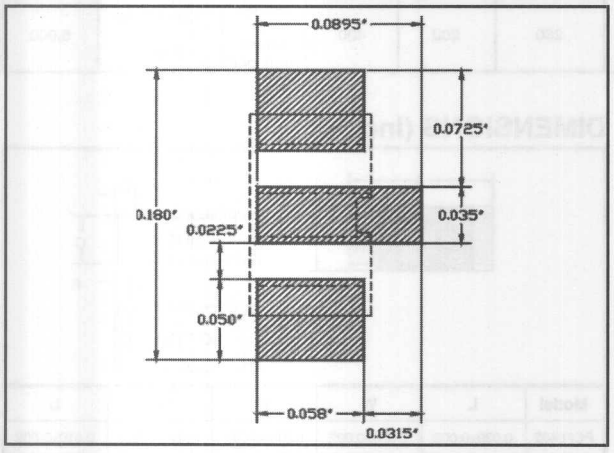
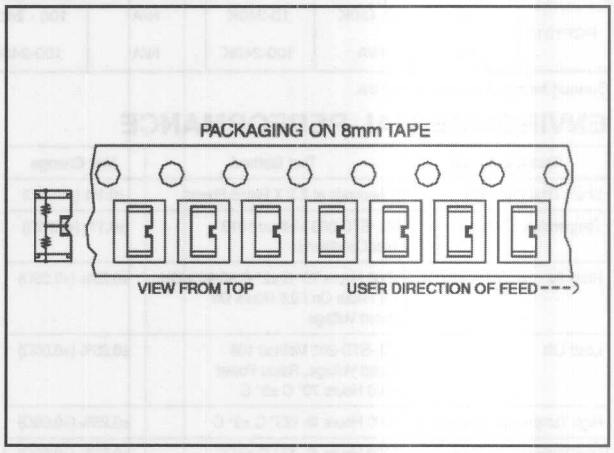
DIMENSIONS (Inches):



RECOMMENDED SOLDER PAD DIMENSIONS:



TAPE AND REEL



HOW TO ORDER

Sample Part Number: PFC - D1206 - 03 - 1003 - 3301 - F B

Model
D1206
F=±1%

TCR Characteristic
01 = ±100 ppm/°C, 02 = ±50 ppm/°C, 03 = ±25 ppm/°C
F=±1%

R1 Resistance Code

Ratio Tolerance
A=±0.05%, B=±0.1%, D=±0.5%,

Absolute Tolerance
A=±0.05%, B=±0.1%, D=±0.5%,

R2 Resistance Code

PRECISION CHIP RESISTOR
NICHROME THIN FILM

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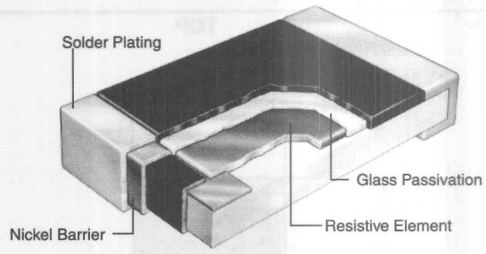
IRC

PCF SERIES



- Wide ohmic range 10Ω to 250KΩ
- Tolerances to ±0.1%
- TCR to "5 ppm/°C
- Available in five standard sizes

SPECIFICATIONS

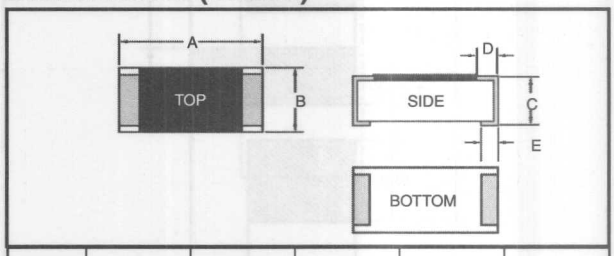
P/N	TCR (ppm/°C)	Ohmic Range (Ω) 1%	±0.5%	±0.25%	±0.1%	Rated Power at 70°C (milliwatts)	Max Working Voltage	Max Overload Voltage	Marking	Packaging Carrier Tape	Qty
PCF0402	±100 ±50 ±25	N/A	10-100K 10-10K 100-10K	N/A	N/A	62.5	50	100	N/A	Cardboard or Plastic	10,000
PCF0603	±100 ±50 ±25	N/A	36K-330K 10-33K 100-33K	N/A	N/A N/A 100-33K	62.5	75	150	3-Digit E-24 Values	Cardboard or Plastic	5,000
PCF0805	±50 ±25 ±10	10-150K 10-100K N/A	10-150K 10-100K 100-100K	N/A 51-100K 100-100K	N/A 51-100K 100-100K	100	100	200	3-Digit E-24 Values	Cardboard or Plastic	5,000
PCF1206	±50 ±25 ±10 ±5	10-360K 10-130K N/A N/A	10-360K 10-130K 100-130K 100-130K	51-360K 100-100K N/A N/A	N/A 51-130K 100-130K 100-130K	125	100	200	4-Digit E-96 Values Available*	Cardboard or Plastic	5,000
PCF1210	±25 ±10	10-130K N/A	10-240K 100-240K	N/A N/A	100 - 240K 100-240K	250	200	400	4-Digit E-96 Values Available*	Cardboard or Plastic	5,000

Consult factory for specific values.

ENVIRONMENTAL PERFORMANCE

Test Conditions	Test Method	Max Change
Short Time Overload	5 Seconds at 2.5 X Rated Power	±0.1% (+0.05Ω)
Temperature Cycling	MIL-STD-883 Method 1010 Test Condition B	±0.1% (+0.05Ω)
Humidty	1000 Hours 70° C ±2° C 90-95% RH 1.5 Hours On / 0.5 Hours Off Rated Voltage	±0.25% (+0.05Ω)
Load Life	MIL-STD-202 Method 108 Rated Voltage, Rated Power 1000 Hours 70° C ±3° C	±0.25% (+0.05Ω)
High Temperature Exposure	1000 Hours @ 125° C ±3° C	±0.25% (+0.05Ω)
Low Temperature Exposure	1000 Hours @ -55° C ±3° C	±0.25% (+0.05Ω)
Effects of Solder Heat Dip Method Reflow Method Hand Solder	 10 ±1 Seconds @ 270° C ±5° C 40 ±1 Seconds @ 240° C ±5° C 3 ±1 Seconds @ 300° C ±5° C	 ±0.1% (+0.05Ω) ±0.1% (+0.05Ω) ±0.1% (+0.05Ω)
Solderability	3 ±0.5 Seconds @ 235° C ±5° C	95% Min Coverage

DIMENSIONS (Inches)



Model	L	W	H	a	b
PCF0402	0.039±0.002	0.020±0.002	0.014±0.002	0.008±0.004	0.010±0.002
PCF0603	0.063±0.008	0.032±0.008	0.016±0.004	0.012±0.008	0.012±0.008
PCF0805	0.079±0.008	0.049±0.008	0.016±0.004	0.016±0.008	0.016±0.008
PCF1206	0.126±0.008	0.063±0.008	0.020±0.008	0.020±0.012	0.016±0.008
PCF1210	0.126±0.008	0.100±0.008	0.024±0.008	0.020±0.012	0.016±0.008

HOW TO ORDER

Sample Part Number: PCF - W1206 R - 03 - 1001 - B - P - LT

Model
W0402, W0603, W0805, W1206, W1210

TCR Characteristic
01 = ±100 ppm/°C, 02 = ±50 ppm/°C,
03 = ±25 ppm/°C, 12 = ±10 ppm/°C

Resistance
Standard 4-digit resistance code. Examples: 1003 = 100KΩ, 51R0 = 51Ω

Tape & Reel Packaging

Tape Type (P=Paper, E=Plastic)

Tolerance
B=±0.1%, C=±0.25%, D=±0.5%

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CHIP RESISTOR CAPACITOR NETWORK

ISO-9001 Registered

IRC

PCF RC SERIES

- Resistor and capacitor on one 1206 size chip
- Reduces component count
- Saves board space

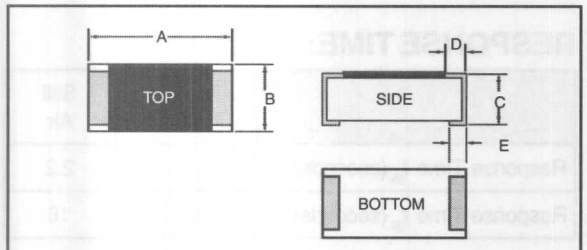
SPECIFICATIONS

	Resistor	Capacitor
Range (Ω)	10.0 to 1.0K	10pF - 200pF
Tolerance	10%(K), 20%(M)	20%(M)
Max Voltage	5V	50V
Power Rating	0.125W	N/A
Operating Temperature	-55°C to +125°C	-55°C to +125°C
Temperature Coefficient (-55°C to +85°C)	200 ppm/°C	+20% / -55%
Dissipation Factor	N/A	5% Max @ 1 KHz

ENVIRONMENTAL PERFORMANCE

Test	Method	Test Limits
Terminal Strength	3mm bending for 10 seconds	No mechanical damage
Resistance to Solder Heat	260°C ±5°C for 10 ±1 seconds	ΔR: ±3% ΔC: ±10%
Resistance to Vibration	(10~55~10Hz) for 1min. Amplitude 1.5mm 3 directions for 2 hours	ΔR: ±3% ΔC: ±10%
Solderability	235°C ±5°C for 3 ± ½ seconds	ΔR: ±3% ΔC: ±10%
Temperature Cycling	-40°C / 30 min., +125°C/30 min., 100 cycles	ΔR: ±3% ΔC: ±10%
Load Life	+70° C ± 2° C, DC50V 90 min 'on', 30 min 'off' 1000 hours	ΔR: ±3% ΔC: ±10%
Load Life in Humidity	+70°C ±2°C 90~95% RH, DC50V 90 min 'on', 30 min 'off' 1000 hours	ΔR: ±3% ΔC: ±10%

DIMENSIONS (Millimeters)



Model	A	B	C	D	E
RC1206	3.2±0.2	1.6±0.2	0.7±0.1	0.5±0.3	0.4±0.2

HOW TO ORDER

Sample Part Number: **PCF - RC1206 - 330 - K - 470 - M**

Family

Model
RC1206

Resistor Code
Example: 330 = 33S, 101 = 100S

Resistor Tolerance
K=10%, M=20%

Packaging Available
Tubes, Tape & Reel

Capacitor Tolerance
M = ±20%

Capacitor Code
Example: 470 = 47pF, 101 = 100pF

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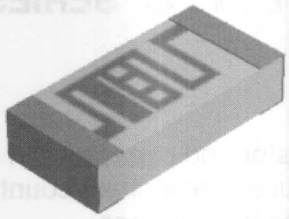
PLATINUM SENSOR CHIP RESISTOR

ISO-9001 Registered

IRC

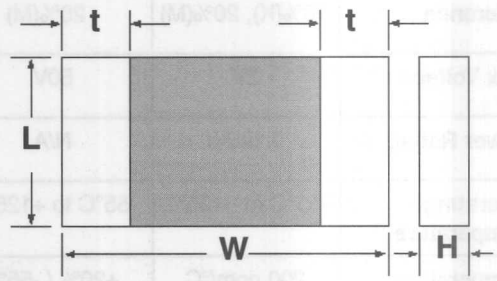
PTS1206 SERIES



- Popular 1206 chip size
- Small surface mount package
- Wrap-around solder coated termination with nickel barrier

The PTS1206 Platinum Temperature Sensor is a surface mount component designed for temperature sensing or temperature compensation in instrument, HVAC, and computer applications.

DIMENSIONS:



W	L	H	t
0.126±0.008	0.063±0.008	0.024±0.004	0.020±0.010

SPECIFICATIONS:

Resistance at 0°C	100Ω ±0.5% [1]
Temperature Range	-50°C to +125°C
Temperature Coefficient	3750 ±100 ppm/°C
Insulation Resistance	10 MΩ min at 25°C
Measuring Current (100Ω)	1 mA, 3 mA max
Long Term Stability (1000 hours at 125°C)	0.1% (typical)
Termination	SnPb
Self Heating	0.13K/mW
Note 1: Other Resistances and Tolerances Available	

RESPONSE TIME:

	Rapidly Stirred Oil	Still Air
Response Time t_{05} (seconds)	0.2	2.2
Response Time t_{09} (seconds)	0.8	16

HOW TO ORDER

Sample Part Number: RTD - P1206 - 40 - 1000 - D

MODEL
P1206

TCR
40 = 3750 ±100 PPM/°C

TOLERANCE
D=±0.5%

RESISTANCE
Standard 4-digit MIL Resistance Code
Examples: 1000 = 100Ω

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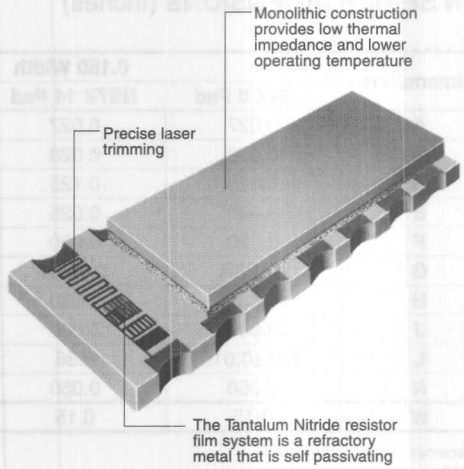
TANFILM® PRECISION RESISTOR ARRAY

ISO-9001 Registered

SON SERIES



- Available in 0.210" and 0.150" widths
- Superior temperature performance
- Absolute TC to ±15 ppm/°C
- Tracking to ±2 ppm/°C
- Military screening available
- Absolute tolerance to ±0.02%
- Ratios to ±0.01%
- Compatible with standard SOIC footprints

IRC's TaNFilm® Small Outline Leadless Resistor Networks is ideally suited for applications requiring precision, long term reliability and stability in a small area. Its monolithic construction eliminates vulnerable terminations such as solder connections. The SON package is ideal for the all surface mount production reflow techniques. The TaNFilm® SON Network provides all the unique qualities of our other TaNFilm® package configuration. Testing has demonstrated performance exceeding MIL-PRF-83401 characteristic H.

Precise laser trimming enables us to achieve extremely close tolerance and tight ratios. Our in-house CAD system and photo-etch process makes custom circuit configurations and multiple resistance values easily achievable. The tantalum nitride resistor film system is a refractory metal that is self passivating providing extreme temperature capabilities and superior environmental characteristics that surpass military requirements. For surface mounted resistor network applications requiring reliability, stability, accuracy and low noise characteristics in the latest leadless configurations, specify the IRC SON resistor network.

4 through 24 Terminals Available

Custom Circuits and Special Screening Available.

Specifications

Resistance Ranges (ohms)	Isolated: 50 to 100K Bussed: 50 to 50K Higher resistance values available
Standard Resistance Tolerance (±%)	0.1, 0.5, 1, 2 (0.02 available)
Temperature Coefficient (ppm/°C)	±15, ±25, ±50, ±100
TCR Tracking (Reference to R1)	±5 ppm/°C standard (±2 ppm/°C available)
Temperature Range	-55°C to +150°C
Noise Level	Less than -25 db
Terminations	Gold over nickel over copper (Solder coating available)
Substrate Material	99.5% pure alumina ceramic
Construction	Conformal coat epoxy

Power Rating

	Model	Resistor	Network
Power Rating @ 70°C (watts)	NS4X, N959 & N989	0.1	0.4
	NS7X, N987 & N989	0.1	0.7
	NS8X, N998 & N999	0.1	0.8

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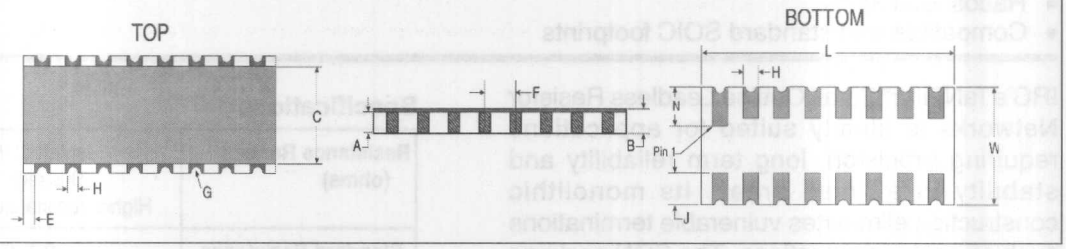
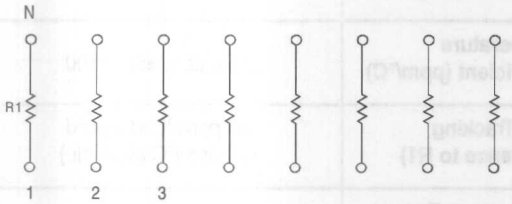
SON SERIES DIMENSIONS (Inches)

Dimensions	0.150 Width			0.210 Width		
	NS4X 8 Pad	NS7X 14 Pad	NS8X 16 Pad	N95X 8 Pad	N98X 14 Pad	N99X 16 Pad
A	0.027	0.027	0.027	0.027	0.027	0.027
B	0.028	0.028	0.028	0.028	0.028	0.028
C	0.125	0.125	0.125	0.17	0.17	0.17
E	0.025	0.025	0.025	0.025	0.025	0.025
F	0.050	0.050	0.050	0.050	0.050	0.050
G	0.009R	0.009R	0.009R	0.010R	0.010R	0.010R
H	0.030	0.030	0.030	0.030	0.030	0.030
J	0.040	0.040	0.040	0.040	0.040	0.040
L	0.21±0.010	0.36	0.41	0.20	0.35	0.40
N	0.050	0.050	0.050	0.050	0.050	0.050
W	0.15	0.15	0.15	0.21	0.21	0.21

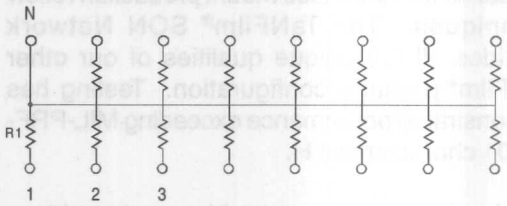
Tolerances Unless Otherwise Noted -
.XXX is +.005
.XX is .010



SCHEMATICS:



Schematic A



Schematic B

HOW TO ORDER:

Sample Part No.: **SON - N989 - 03 - 1001 - B B**

Family

Model Number

NS4A, N959: 4 resistor, Schematic A, 8 pad SON
NS4B, N954: 7 resistor, Schematic B, 8 pad SON
NS7A: N989: 7 resistor, Schematic A, 14 pad SON
NS7B, N987: 13 resistor, Schematic B, 14 pad SON
NS8A, N999: 8 resistor, Schematic A, 16 pad SON
NS8B, N998: 15 resistor, Schematic B, 16 pad SON

Characteristic

Code	Classification	TCR (ppm/°C)
01	Commercial Grade	±100
02	Commercial Grade	±50
03	Commercial Grade	±25
04	Military Screening	±300
05	Military Screening	±100
06	Military Screening	±50
07	Military Screening	±25

Ratio Tolerance to R_1
(if specified)

Absolute Tolerance
Standard MIL tolerance code

Absolute/Ratio Tolerance Code
A=±0.05%; B=±0.1%; C=±0.25%; D=±0.5%; F=±1.0%;G=±2.0%; Q=±0.02%; T=0.01%

Resistance
Standard MIL resistance code.
Example: 1001 = 1000 ohms

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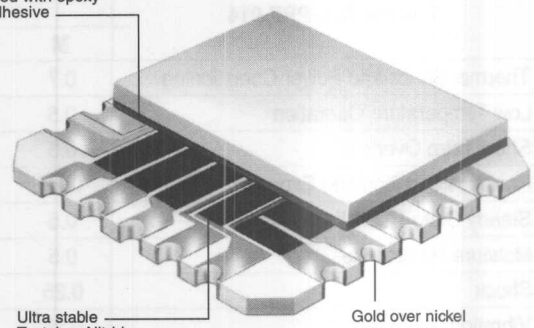
TANFILM® CHIP CARRIER RESISTOR NETWORK

ISO-9001 Registered

CCN SERIES



- Qualified DESC 87017 and 87018
- Increased component density
- Ideal for all reflow soldering techniques
- Best tolerances: ±0.02% absolute ±0.01% ratio
- Custom schematics readily available
- Meet JEDEC standard for type 'C' package
- Superior temperature performance: Absolute T.C. to ±10 ppm/°C Tracking ±5 ppm/°C standard (±2% ppm/°C available)

The IRC TaNFilm® Chip Carrier Network offers higher lead density, increased component count, lower installed resistor cost, better reliability, and is ideal for use with all surface mount solder techniques. In addition, the TaNFilm® leadless Chip Carrier Network provides all the unique qualities of our other TaNFilm® package configurations. Testing has demonstrated performance exceeding MIL-PRF-83401 Characteristic H.

Precise state-of-the-art laser trimming provides close tolerances and tight ratios. The TaNFilm® process enables IRC to manufacture custom circuit configurations and multiple resistance values without sacrificing the tightest tolerance and tracking characteristics of precision networks. The Tantalum Nitride resistor material is passivated for environmental protection surpassing military requirements and guaranteeing exceptional ratio stability.

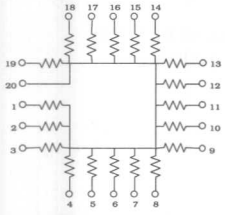
For applications requiring a high degree of reliability, stability, accuracy and low noise, plus advantages of new resistor configuration, specify the IRC Leadless Chip Carrier Configuration Resistor Network.

SPECIFICATIONS

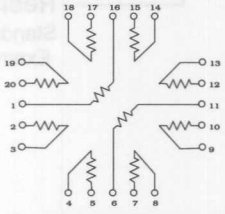
Resistance Ranges (Ω)	10 to 300K
Resistance Tolerances (±%)	0.05, 0.1, 0.25, 0.5, 1, 2 (0.02 available)
Ratio Accuracy when specified	to ±0.01%
Power Rating @ 70°C	0.1 watt/resistor, 1.0 watt/network
Temperature Range	-55°C to +150°C
Temperature Coefficient of Resistance (ppm/°C)	±15, ±25, ±50, ±100
TCR Tracking (R>200Ω)	±5 ppm/°C
Noise	Less than -25 db
Terminations	Gold over nickel over copper. Solder tinned available.
Lead Material	Gold plated copper alloy Solder tin available
Substrate Material	99.5% pure alumina substrate
Construction	Ceramic chip/epoxy/ceramic

Meets JEDEC Standard for Type "C" Package
Custom circuits and Special Testing Available
Contact factory for any special features required

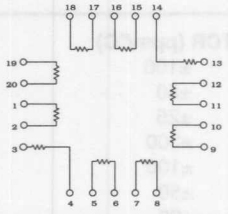
STANDARD CIRCUIT



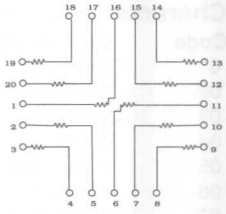
7900
ONE PIN COMMON



7907
ISOLATED



7908
ISOLATED



7909
ISOLATED

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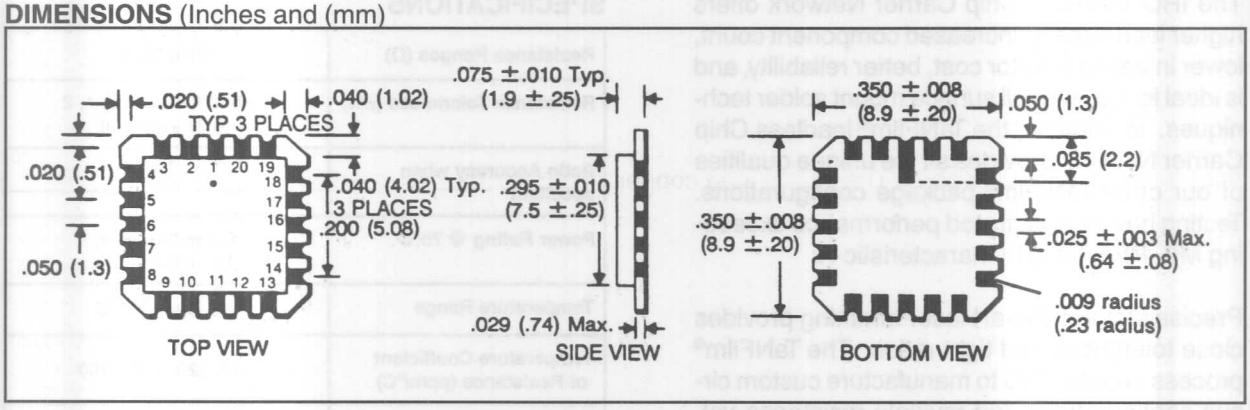
CCN PERFORMANCE DATA

Test Per MIL-PRF-914	MIL-PRF-914 Limits (ΔR%)				TaNFilm Test Data (ΔR%)	
	M	K	H	V	Max	Typical
Thermal Shock and Power Conditioning	0.7	0.7	0.5	0.25	0.1	0.02
Low Temperature Operation	0.5	0.25	0.1	0.1	0.05	0.02
Short Term Overload	0.5	0.25	0.1	0.1	0.05	0.02
Resistance to Bonding Exposure	0.25	0.25	0.25	0.25	0.1	0.02
Steady State Humidity	0.5	0.5	0.5	0.2	0.1	0.03
Moisture Resistance	0.5	0.5	0.4	0.25	0.1	0.03
Shock	0.25	0.25	0.25	0.25	0.1	0.03
Vibration	0.25	0.25	0.25	0.25	0.1	0.03
Life	2.0	0.5	0.5	0.5	0.1	0.03
High Temperature Exposure	1.0	0.5	0.2	0.1	0.1	0.03
Low Temperature Storage	0.5	0.25	0.1	0.1	0.05	0.01

DIMENSIONS (Inches and (mm)



HOW TO ORDER

Sample Part No.: **CCN - 7900 - 01 - 1001 - B - B**

Family

Model

7900: 19 resistor, pin #20 common, min. 20 ohms, 100K ohms (std.)
7907: 10 resistor, isolated resistors, min. 50 ohms, 200K ohms (std.)
7908: 10 resistor, isolated resistors, min. 50 ohms, 200K ohms (std.)
7909: 10 resistor, isolated resistors, min. 50 ohms, 200K ohms (std.)

Characteristic

Code	Classification	TCR (ppm/°C)
01	Commercial Grade	±100
02	Commercial Grade	±50
03	Commercial Grade	±25
04	Military Screening	±300
05	Military Screening	±100
06	Military Screening	±50
07	Military Screening	±25

Ratio Tolerance to R1
(if specified)

Absolute Tolerance

Absolute/Ratio Tolerance Code
A=±0.05%; B=±0.1%; C=±0.25%; D=±0.5%; F=±1.0%;G=±2.0%;

Resistance
Standard MIL Resistance Code.
Example: 1001 = 1000 ohms

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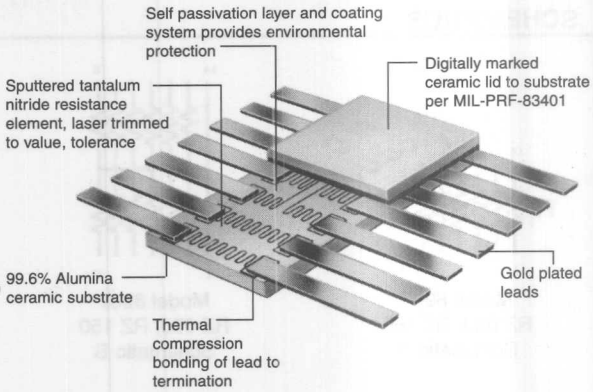
TANFILM® 8900 RESISTOR NETWORKS

ISO-9001 Registered

FLAT PACK SERIES



- Qualified to MIL-R-83401/03, /10 (14 & 16 pin), /15 (14 pin Hi-Rel)
- Qualified "H" characteristics and "B" tolerance
- Custom schematics readily available
- Ultra precision - absolute tolerance to ±0.02% ratios to ±0.01%
- ±1 ppm/°C TCR tracking available

TaNFilm® resistor networks are designed for use in applications requiring a high degree of reliability, stability, tight tolerance, close TCR tracking, and low noise. The sputtering process for resistor formation has been perfected to allow a continuous feed production line under high vacuum conditions, thus, insuring uniformity of properties between networks. Laser trimming makes tight ratios easily achievable. The gold plated copper leads are solid phase welded to a large area of gold conductor pads on the ceramic substrate assuring the most reliable termination and long term stability. The Tantalum Nitride resistor material is passivated for environmental protection insuring excellent performance far superior to military requirements.

Our TaNFilm® process enables us to manufacture networks containing different resistance values and still maintain tight tolerances and tracking characteristics. The nature of our photo-etch process makes it readily adaptable to meet each individual customer's needs. Custom circuit designs and special mechanical configurations can be easily achieved with a modest set up charge while maintaining our high standards of precision and reliability.

SPECIFICATIONS

Mil Qualified Resistance Ranges (Ω)	Schematic A: 49.9 to 121K Schematic B: 49.9 to 121K *(Higher resistance values available)*
Standard Resistance Tolerance (±%)	0.1, 0.25, 0.5, 1, 2 *(0.02 available)*
Ratio Accuracy when specified (±%)	to 0.01
Temperature Range	-55°C to +150°C
Temperature Coefficient of Resistance (ppm/°C)	±25, ±50, ±100,and ±300
TCR Tracking (Reference to R1)	±5 ppm/°C *(±20 ppm/°C for 8987 and 8998 < 500Ω)* *(±2 ppm/°C available, consult factory)*
Noise	Less than -25 db
Ratio Tolerance	to ±0.01%
Power Ratings	0.1 watt per resistor 0.5 watt per network at 70°C 1.0 watt per network at 25°C
Lead Material	Gold plated copper alloy Solder tin available
Construction	Ceramic sandwich package
Packages	Up to 20 leads

FLAT PACK PERFORMANCE DATA

Test Per MIL-PRF-83401	MIL-PRF-83401 Limits (Δ R%)				TaNFilm® Test Data (ΔR%)	
	M	K	H	V	Max	Typical
Thermal Shock and Power Conditioning	0.7	0.7	0.5	0.25	0.1	0.02
Low Temperature Operation	0.5	0.25	0.1	0.1	0.1	0.01
Short Term Overload	0.5	0.25	0.1	0.1	0.05	0.01
Terminal Strength	0.25	0.25	0.25	0.1	0.1	0.01
Resistance to Solder Heat	0.25	0.25	0.1	0.2	0.1	0.02
Moisture Resistance	0.5	0.5	0.4	0.25	0.1	0.03
Shock	0.25	0.25	0.25	0.25	0.1	0.03
Vibration	0.25	0.25	0.25	0.1	0.1	0.03
Life	2.0	0.5	0.5	0.1	0.1	0.03
High Temperature Exposure	1.0	0.5	0.2	0.1	0.1	0.03
Low Temperature Storage	0.5	0.25	0.1	0.1	0.1	0.02
25°C Double Load	2.0	0.5	0.5	0.1	0.05	0.03

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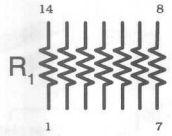
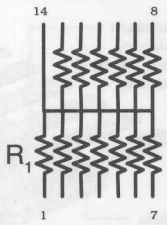
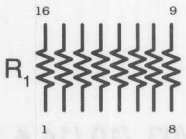
SCHEMATICS



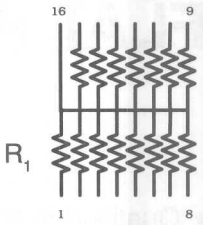
Model 8989
RZ 030, RZ 150
Schematic A



Model 8987
RZ 030, RZ 150
Schematic B

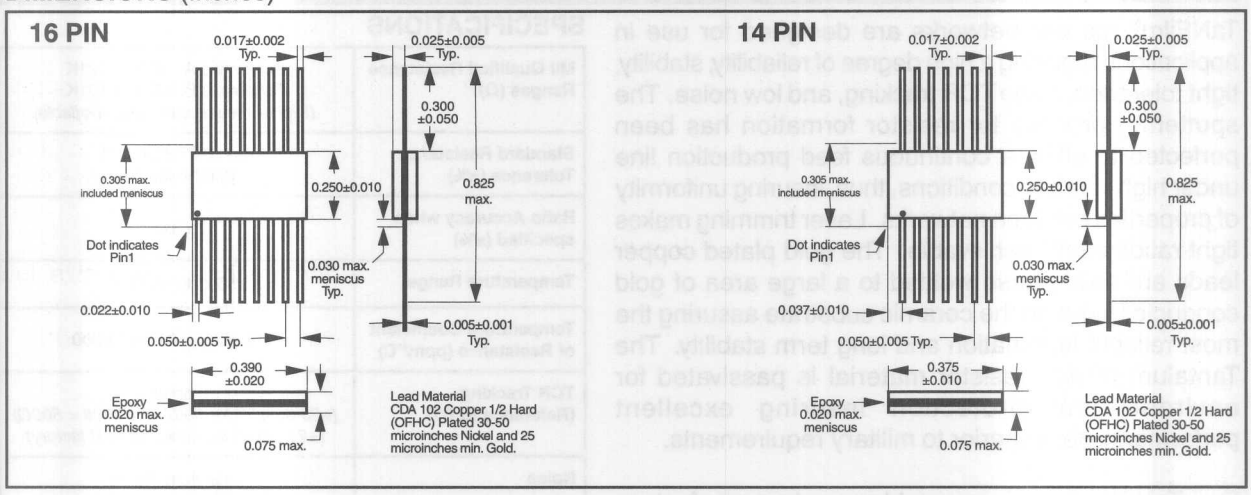


Model 8999
RZ 100
Schematic A



Model 8998
RZ 100
Schematic B

DIMENSIONS (Inches)



HOW TO ORDER

Sample Part No. **FP - 8987 - 05 - 1001 - B - X**

Family

Model
8989: 7 resistor, 14 pin flat pack, isolated, MIL-R-83401/03, Schematic A
8999: 8 resistor, 16 pin flat pack, isolated, MIL-R-83401/10, Schematic A
8987: 13 resistor, 14 pin flat pack, one common lead, MIL-R-83401/03, Schematic B
8998: 15 resistor, 16 pin flat pack, one common lead, MIL-R-83401/10, Schematic B

Characteristic

Code	Classification	TCR (ppm/°C)
01	Commercial Grade	±100
02	Commercial Grade	±50
03	Commercial Grade	±25
04	MIL-R-83401M	±300
05	MIL-R-83401K	±100
06	MIL-R-83401H	±50
07	Military Screening	±25

Ratio Tolerance to R_1
(if specified)

Absolute Tolerance
Standard MIL tolerance code

Absolute/Ratio Tolerance Code
A=±0.05%; B=±0.1%; C=±0.25%; D=±0.5%; F=±1.0%;G=±2.0%; Q=±0.02%; T=0.01%

Resistance
Standard MIL resistance code.
Example: 1001 = 1000 ohms

NOTE:
For HI-REL version RZ150 add "HR" after the model number.

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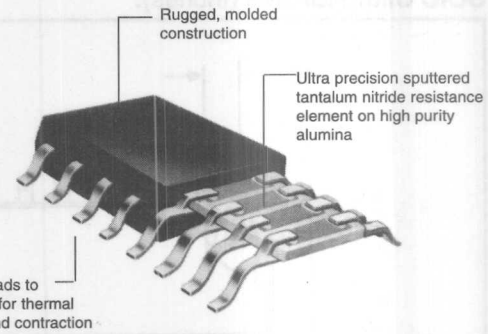
TANFILM® RESISTOR NETWORK ON CERAMIC

ISO-9001 Registered

SOIC SERIES

.150, .220 & .300 WIDE



NOTE: GS Series utilizes chip & wire bond construction

- DESC 87012 and 87013 available
- Thin film precision
- Designed for reflow soldering techniques
- Reliable, no internal cavity
- 0.150", 0.220" and 0.300" sizes available
- Ceramic Substrate Technology
- Standard JEDEC packages for automatic placement equipment

IRC's TaNFilm®, Small Outline Integrated Circuit resistor networks are ideally suited for surface mounting. The 0.05 inch lead spacing provides higher lead density, increased component count, lower installed resistor cost, and better reliability. They are ideally suited for the latest surface mount assembly techniques, and each lead can be 100% visually inspected. The compliant leads relieve thermal expansion and contraction stresses created by soldering and temperature excursions.

The Tantalum Nitride film system provides precision tolerance, exceptional TCR tracking, and low noise. TaNFilm® provides stability, high reliability, and long life characteristics.

Testing has demonstrated performance exceeding MIL-PRF-83401 characteristic H.

The proven TaNFilm® manufacturing process begins with our in-house CAD system for both standard and custom designs. Vacuum sputtering on high purity alumina ceramic, exacting photo-etching and laser trimming formulate the resistor network.

For applications requiring precision, small size, low cost, low noise, high frequency and high power density, specify IRC Gull Wing resistor networks.

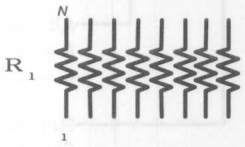
SPECIFICATIONS:

Resistance Range (ohms)			Absolute Tolerance*	Ratio Tolerance to R1*	TCR* (ppm/°C)	TCR* Tracking to R1* (ppm/°)	Operating Temp. Range	Noise	Substrate	Lead Material
GS Series	GM Series	GL Series								
Sch. A 10-100K	Sch. A 10-150K	Sch. A 10-150K	available to 0.1%	available to 0.1%	±25 ±50 ±100	±5	-55°C to +125°C	Less than -25 dB	99.5% pure alumina substrate	Copper alloy, 60/40 solder plate
Sch. A 10-50K	Sch. A 10-75K	Sch. A 10-75K								

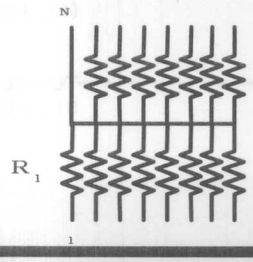
Custom circuits and special testing available.
**Contact factory for values below 200 ohms.*

STANDARD CIRCUITS:

Schematic A



Schematic B
(Highest No. Pin is common)



POWER DISSIPATION (watts @ 70°C)

	Schematic A		Schematic B	
	Per Resistor	Per Package	Per Resistor	Per Package
GS Series 8 pin	0.10	0.40	0.062	0.40
GS Series 14 pin	0.10	0.70	0.062	0.70
GS Series 16 pin	0.10	0.80	0.062	0.80
GM Series 14 pin	0.16	1.0	0.08	1.0
GM Series 16 pin	0.16	1.2	0.08	1.2
GL Series 16 pin	0.16	1.5	0.10	1.2
GL Series 20 pin	0.16	1.2	0.10	1.5

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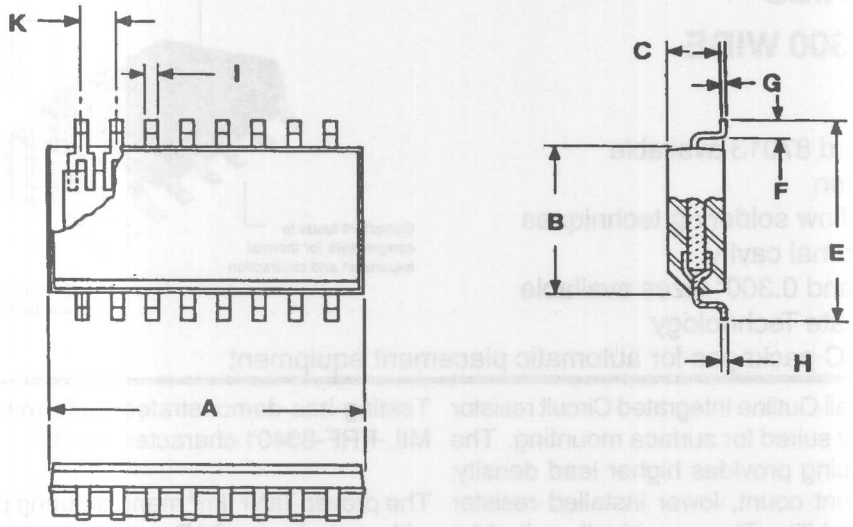
SOIC DIMENSIONS (Inches):



	GS4x	GS7x	GS8x	GM7x	GM8x	GL8x	GL0x
A	.193±.003	.341±.004	.390±.004	.390±.005	.440±.005	.440±.005	.504±.008
B	.154±.004	.154±.004	.154±.004	.220±.005	.220±.005	.297±.005	.297±.005
C	.068 Max.	.068 Max.	.068 Max.	.090 Max.	.090 Max.	.105 Max	.105 Max
E	.237±.007	.237±.007	.237±.007	.300±.010	.300±.010	.407±.015	.407±.015
F	.033±.017	.033±.017	.033±.017	.028±.007	.028±.007	.028±.007	.028±.007
G	.010±.002	.010±.002	.010±.002	.010±.002	.010±.002	.010±.002	.010±.002
J	.016±.003	.016±.003	.016±.003	.017±.003	.017±.003	.017±.003	.017±.003
K	.050±.005	.050±.005	.050±.005	.050±.005	.050±.005	.050±.005	.050±.005

HOW TO ORDER

Sample Part Number: **GUL - GM8 A - 03 - 2001 - B A**

Family

Model
GL = .300" Body Width
GM = .220" Body Width
GS = .150" Body Width

Lead Count Codes
4 = 8 Leads
7 = 14 Leads
8 = 16 Leads
0 = 20 Leads

Schematic
A = Isolated
B = Bussed

Ratio Tolerance to R1 (If specified)

Absolute Tolerance Code:
A = ±0.05%; B = ±0.1%;
C = ±0.25%; D = ±0.50%; F = ±1.0%

Resistance:
Standard MIL resistance code
(e.g. 1001 = 1000 ohms)

TCR Code (ppm/°C):
01 = ±100; 02 = ±50; 03 = ±25

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TANCAP™ IEEE 1284 INTEGRATED FILTER NETWORK

ISO-9001 Registered

QRC1284x2™ SERIES

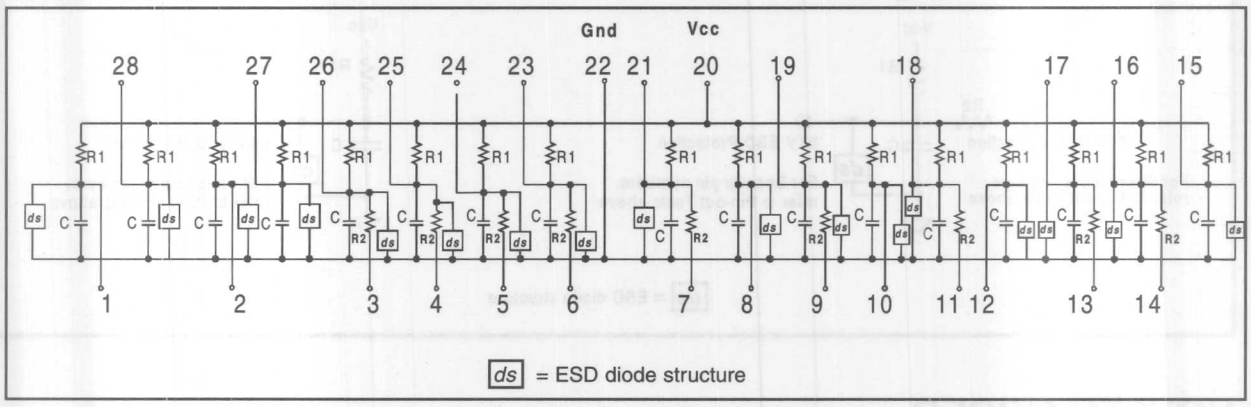
- Single Chip Parallel Port Solution
- Small 28-Pin QSOP Package
- Built-in ESD Protection into 17 Lines
- Highly Integrated - Replaces 43 Discretes
- Proven TaNCap® Thin Film Technology

The IRC TaNCap QRC1284x2 is a single package solution designed for the IEEE1284 enhanced parallel port interface and other digital interface applications. This highly integrated TaNCap thin film technology network offers four different functions in a single 28-pin QSOP package. R1 is a pull-up resistor and R2 is a series termination resistor. Capacitor C is used as a low pass filter. ESD protection is also provided for each termination line.

The 28-pin QSOP package offers a high level of integration in a single surface mount device replacing 43 discrete passive components with one integrated passive network.

The TaNCap series of resistor-capacitor networks are manufactured using proven tantalum nitride thin film technology. For high reliability combined with superior performance, use IEEE 1284 filter networks for your most demanding designs.

SCHEMATIC



RESISTOR AND CAPACITOR SPECIFICATIONS

	Tolerance (%)	TCR (ppm/°C)	Operating Temp. Range (°C)	Max. Power Dissipation (watts)	Operating Voltage
Resistors	±10	±100	-40 to +85	0.1 per resistor	±6 Volts
Capacitors	±20	N/A	-40 to +85	N/A	

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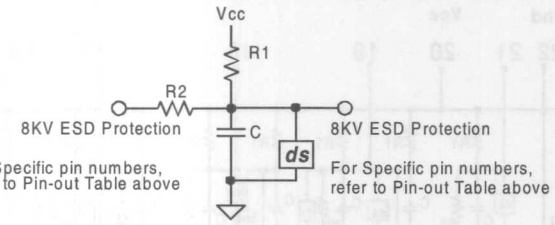
QRC1284x2 Pin-Out Chart

Signal (Compatible Mode)	Source	Termination Resistor R2	Filter Capacitor	Pull-Up Resistor R1	1284x2 Pin	ESD* Protection	1284x2 Pin	ESD* Protection	Circuit Diagram
Data 1	Bi-Directional	X	X	X	25	8KV	4	8KV	1
Data 2	Bi-Directional	X	X	X	24	8KV	5	8KV	1
Data 3	Bi-Directional	X	X	X	23	8KV	6	8KV	1
Data 4	Bi-Directional	X	X	X	21	8KV	7	8KV	1
Data 5	Bi-Directional	X	X	X	19	8KV	9	8KV	1
Data 6	Bi-Directional	X	X	X	18	8KV	11	8KV	1
Data 7	Bi-Directional	X	X	X	17	8KV	13	8KV	1
Data 8	Bi-Directional	X	X	X	16	8KV	14	8KV	1
nAck	Peripheral		X	X	15	8KV			2
Busy	Peripheral		X	X	12	8KV			2
PError	Peripheral		X	X	10	8KV			2
Select	Peripheral		X	X	8	8KV			2
nFault	Peripheral		X	X	27	8KV			2
nInit	Host		X	X	1	8KV			2
nSelectIn	Host		X	X	2	8KV			2
nStrobe	Host	X	X	X	26	8KV	3	8KV	1
nAutoFd	Host		X	X	28	8KV			2

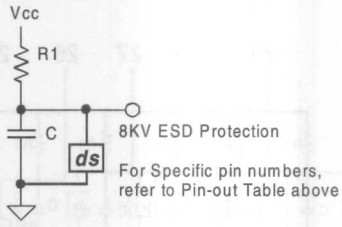
* Human body model per MIL-STD-883 Method 3015.

Circuit Diagrams

Circuit Diagram 1



Circuit Diagram 2



ds = ESD diode structure

HOW TO ORDER

Sample Part Number: **GUS - QRC1284x2 - 1 - K M**

Family

Model
QRC1284x2 = 28-Pin QSOP
IEEE1284 Filter Schematic

Resistor-Capacitor Code
(See RC Code table for available values)

Packaging Available
Tubes, Tape & Reel

Capacitor Tolerance
M = ±20%

Resistor Tolerance
K = ±10%

RC Code Table

Code	R1	R2	C
1	2.2KΩ	33Ω	220pF
2	4.7KΩ	33Ω	180pF

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QRC1284 SERIES

IEEE 1284 FILTER NETWORK

- Improves Signal Quality
- Reduces Unwanted RF Emissions
- Proven TaNSil® Thin Film Technology
- Highly Integrated - replaces Up to 27 Discretes

The IRC TaNCap IEEE 1284 parallel printer interface networks are designed for use in printer and other digital interface applications. These highly integrated TaNSil® technology thin film networks offer three different functions in a single 24-pin QSOP package. R1 is a pull-up resistor for use with open collector and open drain drivers, R2 is a series termination resistor and C acts as a low pass filter.

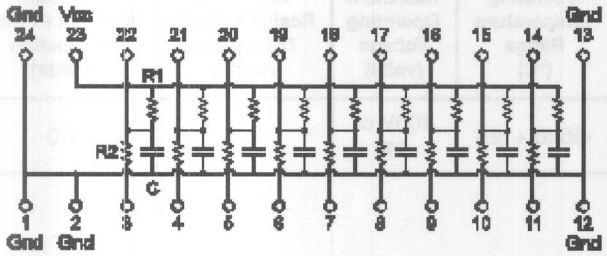
The QSOP package offers a high level of integration in a single surface mount device. Up to 27 discrete components are replaced by one IEEE1284 filter network.

The TaNCap series of resistor-capacitor networks are manufactured using IRC's military and space proven tantalum nitride thin film technology. For high reliability combined with superior performance, use IEEE 1284 filter networks for your most demanding designs.

SPECIFICATIONS

	Range	Tolerance (%)	TCR (ppm/°C)	Operating Temp. Range (°C)	Breakdown Voltage (volts)	Max. Power Dissipation (watts)
Resistors	10Ω to 100Ω	±10	±100	-55 to +125	N/A	0.1 per resistor
Capacitors	10pF to 200pF	±20	N/A	-55 to +125	25	N/A

SCHEMATIC



RESISTOR-CAPACITOR CODE TABLE

Code	R1	R2	C
1	1.0KΩ	10Ω	180pF
2	2.2KΩ	27Ω	220pF
3	4.7KΩ	33Ω	
4	10KΩ		

Example
332: R1 = 4.7KΩ, R2 = 33Ω, C = 220pF

HOW TO ORDER

Sample Part Number: **GUS - QRC1284 - 3 3 2 - K M**

Family

Model
QRC1284 = 24-Pin QSOP
IEEE1284 Filter Schematic

Resistor-Capacitor Code (R1 R2 C)
(See Table above for values)

Packaging Available
Tubes, Tape & Reel

Capacitor Tolerance
M = ±20%

Resistor Tolerance
K = ±10%; M = ±20%

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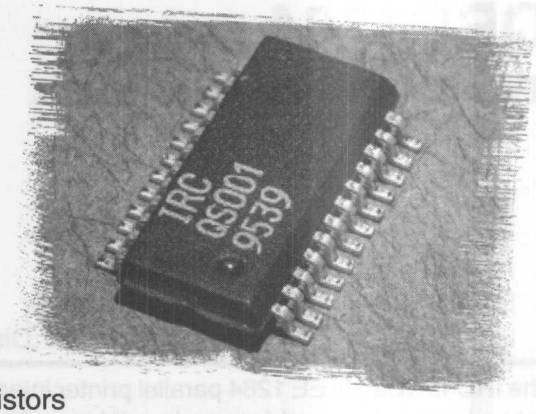
TANSIL® .025" RESISTOR NETWORK ON SILICON

ISO-9001 Registered

QS001 SERIES

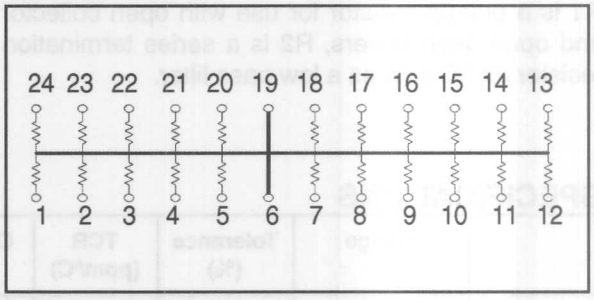
HIGH FREQUENCY TERMINATION NETWORK



- Pull up/down resistor
- QSOP package - small footprint
- Parallel transmission line terminator
- High level of integration - Replaces 22 discrete resistors
- Center located ground pins improve signal integrity at high frequencies

IRC's QS001 series 24 pin QSOP resistor network is specially designed for operation in digital circuits with high frequency, low propagation delay requirements. The device contains 22 TaNSil™ resistor elements which provide rugged, reliable, trouble free operation. The dual, center located common connections provide reduced propagation delay and improved signal integrity over standard bussed schematics.

SCHEMATIC



SPECIFICATIONS

Resistance Range (Ω)	Absolute Tolerance (%)	TCR (ppm/°C)	TCR Tracking (ppm/°C)	Operating Temperature Range (°C)	Maximum Operating Voltage (volts)	Maximum Resistor Power Dissipation (watts)	Maximum Network Power Dissipation (Watts)
30 - 100	±5, ±10, ±20	±25, ±50, ±100	±5	-55 to +125	100V or PR	0.1	1.0

HOW TO ORDER

Sample Part Number: **GUS - QS001 - 03 - 56R0 - K**

Family — GUS

Model — QS001
24 pin QSOP

Temperature Coefficient — 03
01 = ±100; 02 = ±50; 03 = ±25

Resistance — 56R0
Standard MIL resistance code
(e.g. 1001 = 1000 ohms;
1003 = 100,000 ohms)

Tolerance: — K
J = ±5%; K = ± 10%; M = ±20%

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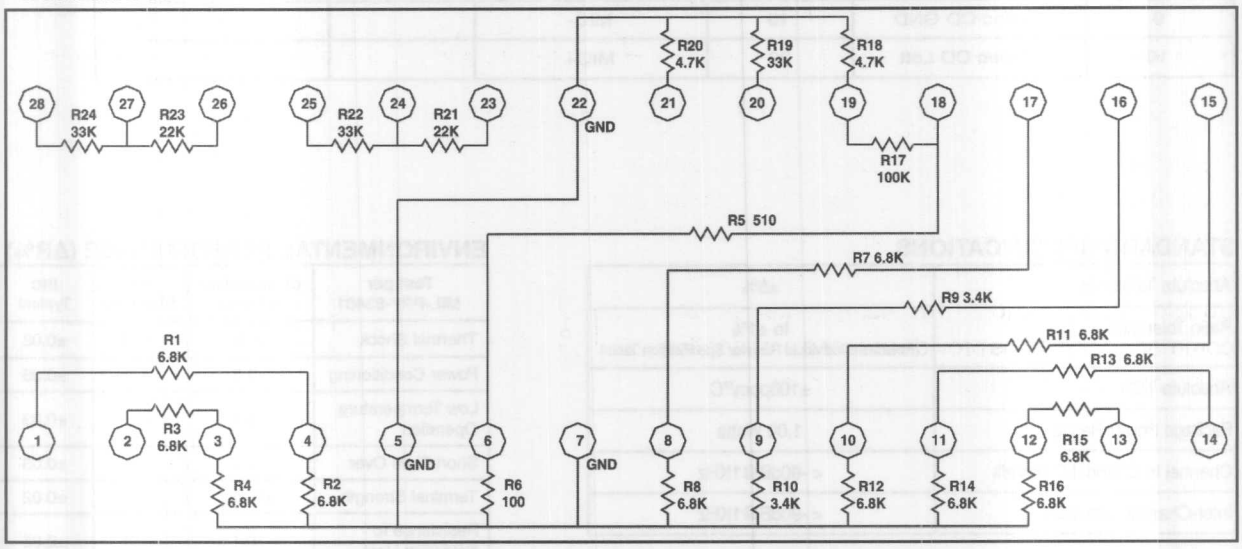
TANSIL™ INTEGRATED AUDIO PASSIVE NETWORK

ISO-9001 Registered

QSO13

- Audio signal conditioning and gain setting network
- Low noise resistors in a QSOP package
- Exceeds AC '97 Codec specifications
- Single chip application ideal for PC audio

SCHEMATIC



INDIVIDUAL RESISTOR SPECIFICATIONS

Resistor	Value (Ω)	Pins	Ratio Tol	Ratio Ref Resistor	Trk TCR (ppm/°C)	Resistor	Value (Ω)	Pins	Ratio Tol	Ratio Ref Resistor	Trk TCR (ppm/°C)
1	6.8k	1,4	-	-	-	13	6.8k	11,14	-	-	-
2	6.8k	4,GND	-	-	-	14	6.8k	11,GND	-	-	-
3	6.8k	2,3	±1%	1	±10	15	6.8k	12,13	±1%	13	±10
4	6.8k	3,GND	±1%	2	±10	16	6.8k	12,GND	±1%	14	±10
5	510	6,18	-	-	-	17	100k	18,19	-	-	-
6	100	6,GND	-	-	-	18	4.7k	19,GND	-	-	-
7	6.8k	8,17	-	-	-	19	33k	20,GND	-	-	-
8	6.8k	8,GND	-	-	-	20	4.7k	21,GND	-	-	-
9	3.4k	9,16	-	-	-	21	22k	23,24	-	-	-
10	3.4k	9,GND	-	-	-	22	33k	25,24	-	-	-
11	6.8k	10,15	±1%	7	±10	23	22k	26,27	±1%	21	±10
12	6.8K	10,GND	±1%	8	±10	24	33k	28,27	±1%	22	±10

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IRC

QSO13 PACKAGE PIN-OUT DETAILS

Pin Number	Pin Label	Pin Number	Pin Label	Pin Number	Pin Label
1	Line In Left	11	Codec Aux Right	21	MIC In
2	Line in Right	12	Codec Aux Left	22	GND
3	Codec Line Right	13	Aux In Left	23	Codec Line Out Left
4	Codec Line Left	14	Aux In Right	24	Amp Left Input
5	GND	15	CD In Left	25	Amp Out Left
6	Codec Mic In	16	CD GND	26	Codec Line Out Right
7	GND	17	CD In Right	27	Amp Right Input
8	Codec CD Right	18	MIC_AMP_OUT	28	Amp Out Right
9	Codec CD GND	19	MIC-		
10	Codec CD Left	20	MIC+		

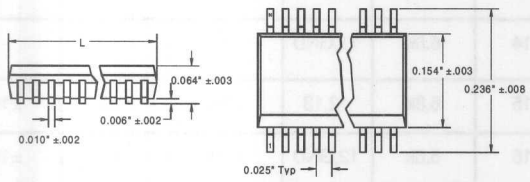
STANDARD SPECIFICATIONS

Absolute Tolerance	±5%
Ratio Tolerance	to ±1% (Reference Individual Resistor Specification Table)
Absolute TCR	±100ppm/°C
Package Power Rating	1.00 Watts
Channel to Channel Crosstalk	< -90dB@1KHz
Inter-Channel Crosstalk	< -90dB@1KHz

ENVIRONMENTAL PERFORMANCE (ΔR%)

Test per MIL-PRF-83401	Characteristic H Limits	IRC Maximum	IRC Typical
Thermal Shock	±0.5	±0.1	±0.02
Power Conditioning	±0.5	±0.2	±0.05
Low Termperature Operation	±0.1	±0.1	±0.03
Short Time Over	±0.1	±0.1	±0.03
Terminal Strength	±0.25	±0.1	±0.02
Resistance to Soldering Heat	±0.1	±0.1	±0.05
Moisture Resistance	±0.4	±0.2	±0.05
Shock	±0.25	±0.1	±0.02
Vibration	±0.25	±0.1	±0.02
Life	±0.5	±0.1	±0.10
High Temperature Exposure	±0.2	±0.1	±0.05
Low Temperature Storage	±0.1	±0.1	±0.03
25°C Double Load	±0.5	±0.1	±0.10

DIMENSIONS



N (# of Leads)	L (±.004)
28	0.389

HOW TO ORDER

IRC Part Number: QS013

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TaNCap™ RC NETWORK
IEEE 1284 FILTER NETWORK

ISO-9001 Registered

QS20Z/QL20Z SERIES

- ECP/EPP High Speed Parallel Port Applications
- Available in QSOP and SOIC Packages
- Proven TaNCap™ Thin Film Technology
- Highly Integrated - Replaces Up to 27 Discretes

The IRC TaNCap™ IEEE 1284 parallel printer interface networks are designed for use in printer, motherboard, disk drives, and other high speed digital interface applications. These highly integrated TaNSil® technology thin film on silicon networks offer three different functions in a single 20-pin QSOP or SOIC package. R1 is a pull-up resistor for use with open collector and open drain drivers, R2 is a series termination resistor and C acts as a low pass filter.

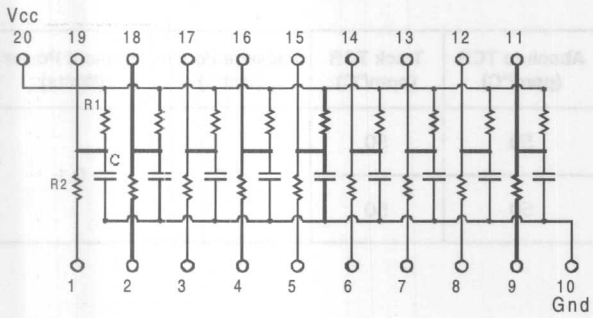
The QSOP package offers a high level of integration in a single surface mount device. Up to 27 discrete components are replaced by one IEEE1284 termination network.

The TaNCap™ series of resistor-capacitor networks are manufactured using IRC's military and space proven tantalum nitride technology. For high reliability and superior performance, use IEEE 1284 filter networks for your digital interface applications.

SPECIFICATIONS

	Range	Tolerance (%)	TCR (ppm/°C)	Operating Temp. Range (°C)	Breakdown Voltage (volts)	Max. Power Dissipation (watts)
Resistors	10Ω to 10KΩ	±10	±100	-55 to +125	N/A	0.1 per resistor
Capacitors	10pF to 200pF	±20	N/A	-55 to +125	25	N/A

SCHEMATIC



RESISTOR-CAPACITOR CODE TABLE

Code	R1	R2	C
1	1.0KΩ	10Ω	180pF
2	2.2KΩ	27Ω	220pF
3	4.7KΩ	33Ω	
4	10KΩ		

Example
332: R1 = 4.7KΩ, R2 = 33Ω, C = 220pF

HOW TO ORDER

Sample Part Number: **GUS - QS20 Z - 3 3 2 - K M**

Family

Model
QS20 = 20 pin QSOP
SL20 = 20 pin 0.300" SOIC

Schematic:
Z = 20 pin IEEE 1284 Terminator

Resistor-Capacitor Code (R1 R2 C)
(See Table above for values)

Packaging Available
Tubes, Tape & Reel

Capacitor Tolerance
M = ±20%

Resistor Tolerance
K = ±10%; M = ±20%

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TANSIL® V.35 PROTOCOL TERMINATION NETWORK

ISO-9001 Registered

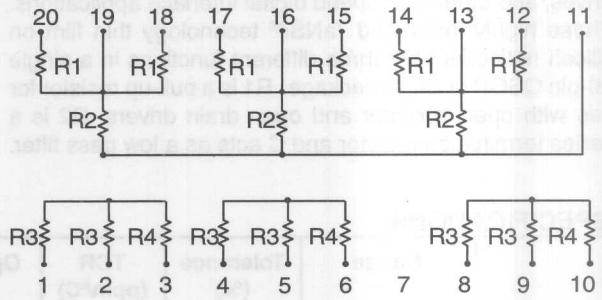
SLOO2 SERIES

- Improves Signal Integrity
- Proven TaNSil® Thin Film Technology
- Integrated Package Reduces Board Space and Assembly Costs

IRC's SL002 integrates 6 receiver and transmitter signal termination networks for the V.35 communication protocols into a single 0.300" wide SOIC package. These TaNSil® technology thin film networks offer rugged, reliable, trouble free operation ideally suited for computer networking applications.

For high reliability with superior performance in a surface mount package, specify IRC's SL002 V.35 termination networks for your most demanding digital communication designs.

SCHEMATIC:



SPECIFICATIONS

Resistors	Value	Absolute Tolerance	Ratio Tolerance	Absolute TCR (ppm/°C)	Track TCR (ppm/°C)	Package Power (Watts)	Element Power (Watts)
R1, R2 (Transmitter)	R1 = 50Ω R2 = 125Ω	2%	2%	50	50	1.6	0.1
R3, R4 (Receiver)	R3 = 51.5Ω R4 = 124Ω	1%	1%	50	50		

HOW TO ORDER

Sample Part Number: **GUS - SL002**

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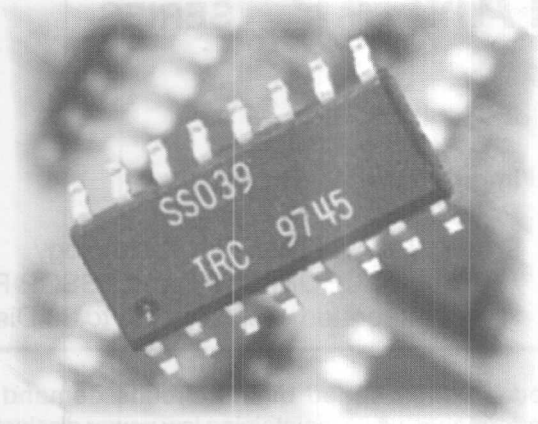
TANCAP® RC NETWORK

ISO-9001 Registered

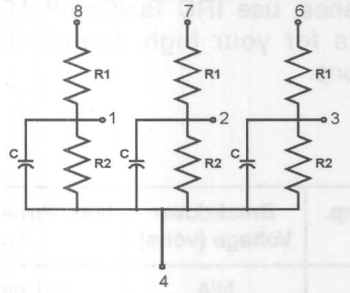
SS038/SS039 SERIES

BATTERY MANAGEMENT NETWORK

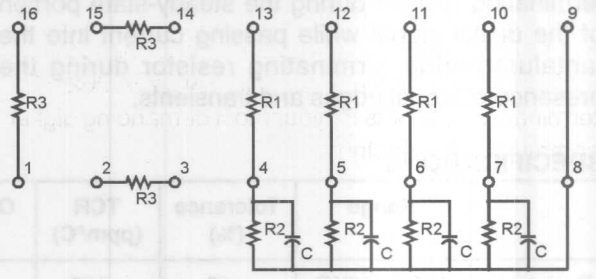


- 1 MegΩ Total Resistance Saves Battery Energy
- Precision 10 to 1 Voltage Divider
- Ultra-Stable TaNFilm® Technology
- Monitoring Capability of Up to 4 Cell Stacks
- Integrated Low Pass Filtering
- High Density 0.150" SOIC Packaging

Schematic Diagrams



8-Pin SOIC SS038



16-Pin SOIC SS039

Specifications

Package Type	Schematic	TCR (ppm/°C)	TCR Track R1/R2 (ppm/°C)	Resistance (Ω) R1	R2	R3	Resistance Tolerance Absolute	Ratio (R1/R2)	Capacitance (pf ±20%)
8-Pin SOIC	SS038	±50	±5	900K	100K	N/A	±5%	±0.5%	100
16-Pin SOIC	SS039	±50	±5	900K	100K	100	±5%	±0.5%	100

HOW TO ORDER:

Sample Part Number: GUS - SS038 - 904 - 104 - J - D

FAMILY

SCHEMATIC
SS038 = 8-Pin SOIC
SS039 = 16-Pin SOIC

R1 NOMINAL RESISTANCE
3 digit resistance code

R2 NOMINAL RESISTANCE
3 digit resistance code

RATIO TOLERANCE
D = ±0.5%

ABSOLUTE TOLERANCE
J = ±5%

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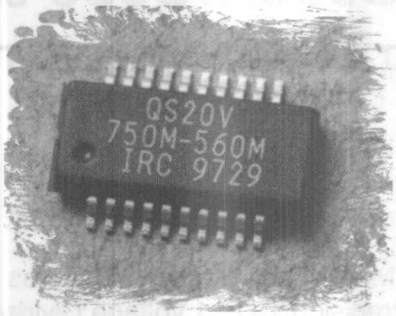
TANSIL® AC LINE TERMINATION NETWORK

ISO-9001 Registered

TANCAP™ SERIES



- Improves Signal Quality
- Reduces Power Dissipation
- Proven TaNSil® Thin Film Technology
- Available in QSOP, SOIC, and TSSOP Packages
- Highly Integrated - replaces Up to 36 Discretes

Today's high speed digital circuits demand top performance while maintaining low power dissipation. IRC's TaNCap™ AC termination networks are designed to meet the needs of the digital circuit designer by blocking DC current flow into the terminating resistor during the steady-state portion of the digital signal while passing current into the tantalum nitride terminating resistor during the presence of signal edges and transients.

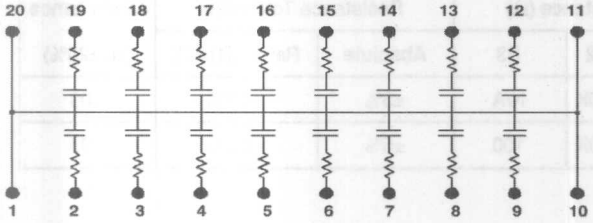
The TaNCap™ series of resistor-capacitor networks are manufactured using IRC's military and space proven tantalum nitride thin film technology.

For high reliability combined with superior performance, use IRC TaNCap™ AC termination networks for your high speed, digital circuit applications.

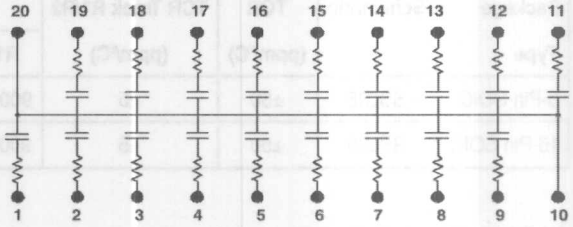
SPECIFICATIONS

	Range	Tolerance (%)	TCR (ppm/°C)	Operating Temp. Range (°C)	Breakdown Voltage (volts)	Max. Power Dissipation (watts)
Resistors	10Ω to 10KΩ	±10	±100	-55 to +125	N/A	0.1 per resistor
Capacitors	10pF to 200pF	±20	N/A	-55 to +125	25	N/A

SCHEMATIC P



SCHEMATIC V



HOW TO ORDER

Sample Part Number: **GUS - QS20 V - 330 - K - 470 - M**

Family

Model
QS20 = 20 pin QSOP
SL20 = 20 pin 0.300" SOIC
TS20 = 20 pin TSSOP

Schematic
P = 16 Circuits, V = 18 Circuits

Resistor Code

Packaging Available
Tubes, Tape & Reel

Capacitor Tolerance
M = ±20%

Capacitor Code
Example: 470=47pF,101=100pF

Resistor Tolerance

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TANSIL® T FILTER NETWORK

ISO-9001 Registered

TANCAP™ SERIES

- Improves Signal Quality
- Reduces Unwanted Signal Transmissions
- Proven TaNSil® Thin Film Technology
- QSOP, SOIC, and TSSOP Packages
- Highly Integrated R-C Network
- High Frequency Design Available

IRC's TaNCap™ T filter networks are designed for the most demanding low pass filter applications. These TaNSil® technology thin film networks offer attenuation of high frequency signal components with minimal inductive effects. EMI/RFI reduction, improved signal quality and reduction of false triggers in digital circuits while minimizing insertion loss are characteristics of these silicon based filter networks.

The SOIC, QSOP, and TSSOP packages offer a high level of integration in today's most popular surface mount configurations. Up to 24 discrete components are replaced by one T filter network.

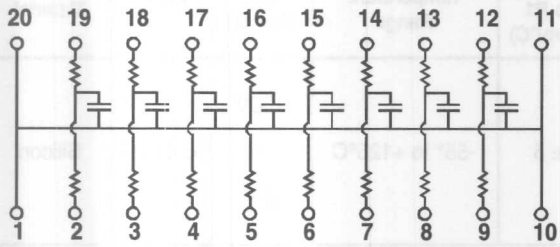
The TaNCap™ series of resistor-capacitor networks are manufactured using IRC's military and space proven tantalum nitride thin film technology.

For high reliability combined with superior performance, use IRC TaNCap™ T Filter networks for your most demanding, high speed analog and digital designs.

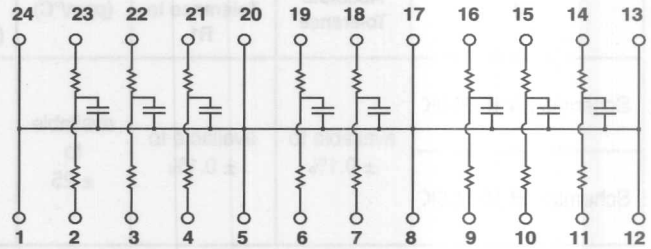
SPECIFICATIONS

	Resistors	Capacitors	
Range	10Ω to 100Ω	10pF to 33pF	34pF to 200pF
Tolerance (%)	±10	±20	±10
Breakdown Voltage (volts)	N/A	200 to 100	100 to 25
Operating Temp. Range (°C)	-55 to +125	-55 to +125	
TCR (ppm/°C)	±100	N/A	
Max. Power Dissipation (watts)	0.1 per resistor	N/A	

SCHEMATIC T



SCHEMATIC M



HOW TO ORDER

Sample Part Number: **GUS - QS20 T - 330 - K - 470 - M**

Family

Model
QS20T = 20 pin QSOP T Filter
QS24M = 24 pin QSOP High Frequency T Filter
SL20T = 20 pin 0.300" SOIC T Filter
SL24M = 24 pin 0.300" SOIC High Frequency T Filter
TS20T = 20 pin TSSOP T Filter
TS24T = 24 pin TSSOP High Frequency T Filter

Resistor Code
Example: 330 = 33Ω, 101 = 100Ω

Packaging Available
Tubes, Tape & Reel

Capacitor Tolerance
M = ±20%

Capacitor Code
Example: 470 = 47pF, 101 = 100pF

Resistor Tolerance
K = ±10%, M = ±20%

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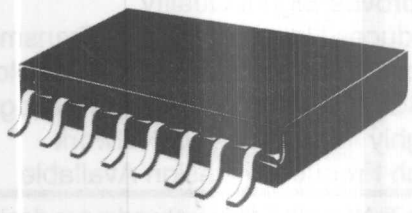
TANSIL® RESISTOR NETWORK ON SILICON

ISO-9001 Registered

SOIC SERIES

.150 BODY WIDTH



- Ultra-Stable TANSIL® resistors on silicon
- Reliable, no internal cavity
- Standard JEDEC packages
- 8,14 and 16 pin sizes available
- High resistor density - 0.050" lead spacing
- Low cost, highly reliable, wire bonded package

IRC's TANSIL® SOIC resistor networks are ideally suited for high volume applications that demand a small printed wiring board footprint. The 0.050" lead spacing provides higher lead density, increased component count, lower resistor cost, and high reliability.

The SOIC series is ideally suited for the latest surface mount assembly techniques and each lead can be 100% visually inspected. The compliant gull wing leads relieve thermal expansion and contraction stresses created by soldering and temperature excursions.

The tantalum nitride film system on silicon provides precision tolerance, exceptional TCR tracking, low cost and miniature package. Excellent performance in harsh, humid environments is a trademark of IRC's self-passivating, TANSIL® resistor film.

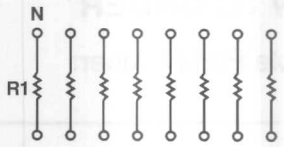
For applications requiring high performance resistor networks in low cost, surface mount package, specify IRC SOIC resistor networks.

SPECIFICATIONS

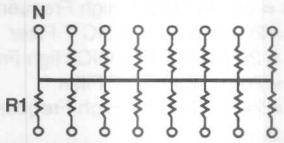
Resistance Range (Ω)	Resistance Absolute Tolerance	Resistance Ratio Tolerance to R1	TCR (ppm/°C)	TCR Tracking to R1 (ppm/°C)	Operating Temperature Range	Max. Op. Voltage	Noise	Substrate Material
Schematic A:10-250K	available to ± 0.1%	available to ± 0.1%	available to ± 25	± 5	-55° to +125°C	100V or pPR	< -25dB	Silicon
Schematic B:10-100K								

POWER DISSIPATION (watts at 70°C)

	Schematic A		Schematic B	
	Per Resistor	Per Package	Per Resistor	Per Package
8 pin	0.10	0.4	0.058	0.4
14 pin	0.10	0.7	0.062	0.7
16 pin	0.10	0.8	0.062	0.8



Schematic A



Schematic B

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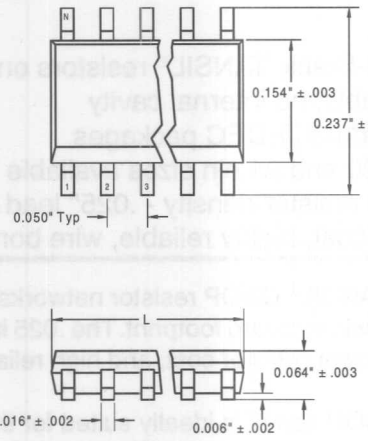
IRC

ENVIRONMENTAL PERFORMANCE (ΔR%)

Test per MIL-PRF-83401	Characteristic H Limits	IRC Maximum	IRC Typical
Thermal Shock	.5	.1	.02
Power Conditioning	.5	.1	.03
Low Temperature Operation	.1	.05	.03
Short Time Over	.1	.05	.02
Terminal Strength	.25	.05	.02
Resistance to Soldering Heat	.1	.05	.02
Moisture Resistance	.4	.1	.03
Shock	.25	.1	.02
Vibration	.25	.1	.02
Life	.5	.1	.05
High Temperature Exposure	.2	.1	.05
Low Temperature Storage	.1	.05	.03
25°C Double Load	.5	.1	.05

DIMENSIONS



Dimensions in inches

N (# of Leads)	L (±.004)
8	0.192
14	0.340
16	0.390

HOW TO ORDER

Sample Part Number: **G U S - S S 8 A - 0 3 - 2 0 0 1 - B A**

Family

Model
SS = Silicon substrate, .150", SOIC

Lead Count
4 = 8 Leads
7 = 14 Leads
8 = 16 Leads

Schematic
A = Isolated
B = Bussed

Ratio Tolerance to R1 (If specified)

Absolute Tolerance Code
A = ±0.05%; B = ±0.1%;
C = ±0.25%; D = ±0.50%; F = ±1.0%

Resistance
Standard MIL resistance code
(e.g. 1001 = 1000 ohms;
1003 = 100,000 ohms)

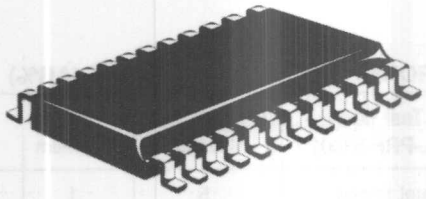
TCR Code (ppm/°C)
01 = ±100; 02 = ±50; 03 = ±25

TANSIL® RESISTOR NETWORK ON SILICON

ISO-9001 Registered

IRC

QSOP SERIES



- Ultra-Stable TANSIL® resistors on silicon
- Reliable, no internal cavity
- Standard JEDEC packages
- 16, 20 and 24 pin sizes available
- High resistor density - .025" lead spacing
- Low cost, highly reliable, wire bonded package

IRC's TANSIL® QSOP resistor networks are ideally suited for high volume applications that demand a small printed wiring board footprint. The .025 inch lead spacing provides higher lead density, increased component count, lower resistor cost, and high reliability.

The QSOP series is ideally suited for the latest surface mount assembly techniques and each lead can be 100% visually inspected. The compliant gull wing leads relieve thermal expansion and contraction stresses created by soldering and temperature excursions.

The tantalum nitride film system on silicon provides precision tolerance, exceptional TCR tracking, low cost and miniature package. Excellent performance in harsh, humid environments is a trademark of IRC's self-passivating, TANSIL® resistor film.

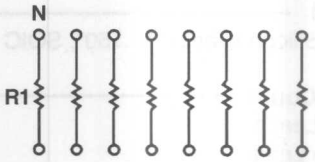
For applications requiring high performance resistor networks in low cost, surface mount package, specify IRC QSOP resistor networks.

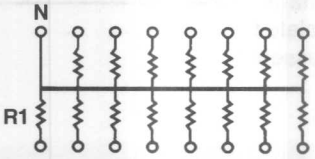
SPECIFICATIONS

Schematic	Resistance Range (Ω)	Absolute Tolerance	Ratio Tolerance	Absolute TCR	Tracking TCR	Operating Temperature Range	Maximum Operating Voltage	Noise	Substrate Material
A	10 - 100K	Available to 0.1%	Available to 0.05%	Available to ±25 ppm/°C	±5 ppm/°C	-55 to +125°C	100V or $\sqrt{PR}$	<-25dB	Silicon
B	10 - 50K								

POWER DISSIPATION (watts at 70° C)

	Schematic A		Schematic B	
	Per Resistor	Per Package	Per Resistor	Per Package
16 PIN	0.1	.75	0.050	.75
20 PIN	0.1	1.0	0.053	1.0
24 PIN	0.1	1.0	0.050	1.0





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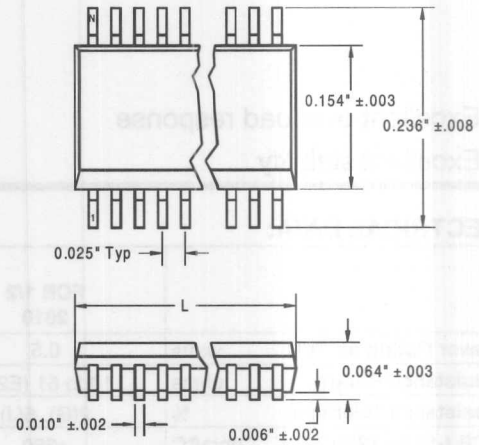
IRC

ENVIRONMENTAL PERFORMANCE (ΔR%)

Test per MIL-PRF-83401	Characteristic H Limits	IRC Maximum	IRC Typical
Thermal Shock	.5	.1	.02
Power Conditioning	.5	.1	.03
Low Termperature Operation	.1	.1	.03
Short Time Over	.1	.1	.02
Terminal Strength	.25	.1	.02
Resistance to Soldering Heat	.1	.1	.02
Moisture Resistance	.4	.1	.03
Shock	.25	.1	.02
Vibration	.25	.1	.02
Life	.5	.1	.05
High Temperature Exposure	.2	.1	.05
Low Temperature Storage	.1	.05	.03
25°C Double Load	.5	.1	.05

DIMENSIONS



Dimensions in Inches

N (# of Leads)	L (±.004)
16	0.193
20	0.341
24	0.341

HOW TO ORDER

Sample Part Number: **GUS - QS CA - 03 - 2001 - B A**

Family

Model Number
QS=Silicon substrate, .150", QSOP

Lead Count
8 = 16 Leads
0 = 20 Leads
C = 24 Leads

Schematic
A = Isolated
B = Bussed

Ratio Tolerance to R1
(if specified)

Absolute Tolerance
A = ±0.05%; B = ±0.1%;
C=±0.25%;D=±0.50%;F=±1.0%

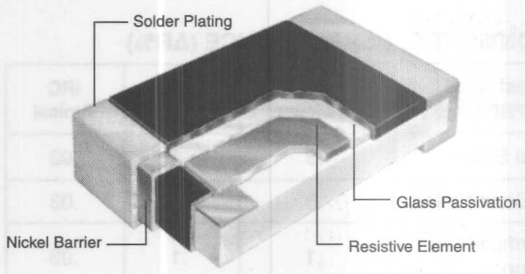
Resistance
Standard MIL resistance code
Example; 2001 = 2,000 ohms

Temperature Coefficient
01 = ±100; 02 = ±50; 03 = ± 25

FUSIBLE CHIP RESISTOR

ISO-9001 Registered

FCR SERIES

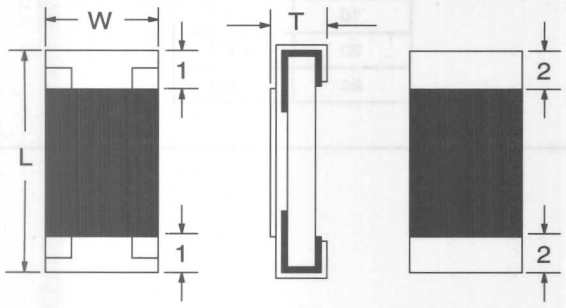


- Excellent overload response
- Excellent stability

ELECTRICAL DATA:

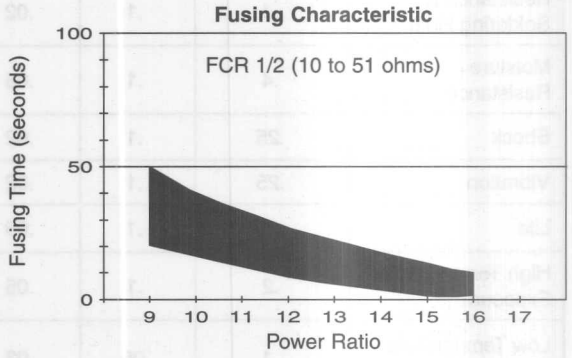
		FCR 1/2 2010
Power Rating at 70°C	watts	0.5
Resistance Range	ohms	10 to 51 (E24)
Resistance Tolerance	%	2(G), 5(J)
TCR (-55 to 125°C)	ppm/°C	±350

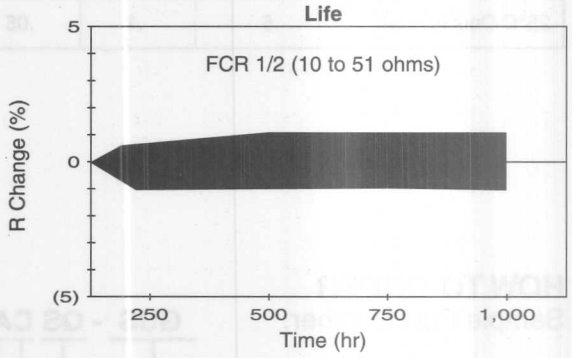
DIMENSIONS (mm):



Type	L	W	T	1	2
2010	+0.10 5.0 -0.15	+0.10 2.6 -0.15	+0.15 0.55 -0.05	0.8±0.2	0.8±0.2

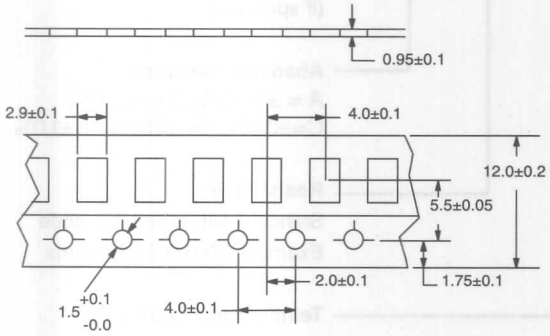
PERFORMANCE DATA:

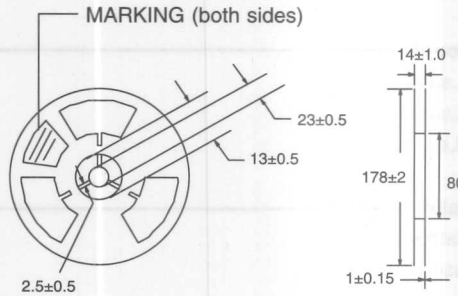




PACKAGING:

All dimensions in (mm).





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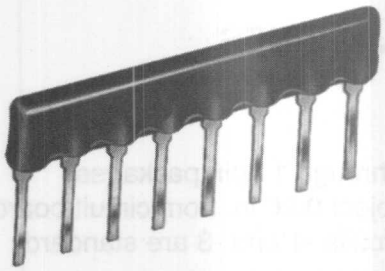
THICK FILM CONFORMAL COATED SIP NETWORK

ISO-9001 Registered

IRC

C SERIES



- 4 through 14 pin packages
- Project 0.256 in. from circuit board
- Circuits -1 and -3 are standard

SPECIFICATIONS:

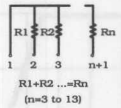
Physical		Environmental Per MIL-R-83401		Electrical	
Element:	Fused thick-film composition	**Short Time Overload:**	±0.5%	**Resistance Range (ohms):**	22 to 1.0M
Substrate:	96% alumina	**Terminal Strength:**	±0.5%	**Resistance Tolerance:**	±1%, ±2%, ±5%
Body:	Conformal coated	**Resistance to Solder Heat:**	±0.5%	**Temperature Coefficient:**	±100 ppm/°C (1% Tol.), ±200 ppm/°C
Terminals:	Solder plated steel	**Moisture Resistance:**	±2%	**Max. Continuous Working Voltage:**	200V
Lead Pull:	2.2 pounds	**Load Life:**	±2%	**Operating Temperature:**	-40°C to 150°C
Lead Solderability:	MIL-STD-202, method 208	**Temperature Cycling:**	±0.5%		
Resistance to Soldering Heat:	MIL-STD-202E, method 210A, cond. A				
Marking Resistance to Solvents:	MIL-STD-202, method 215				

STANDARD RESISTANCE (OHMS):

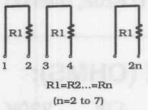
22	150	1K	6.8K	47K	330K
27	180	1.2K	8.2K	56K	390K
33	220	1.5K	10K	68K	470K
39	270	1.8K	12K	82K	560K
47	330	2.2K	15K	100K	680K
56	390	2.7K	18K	120K	820K
68	470	3.3K	22K	150K	1M
82	560	3.9K	27K	180K	
100	680	4.7K	33K	220K	
120	820	5.6K	39K	270K	

STANDARD CIRCUITS:

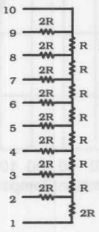
CIRCUIT 1 Bussed



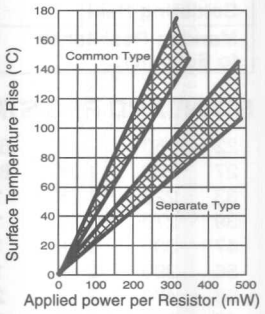
CIRCUIT 3 Isolated



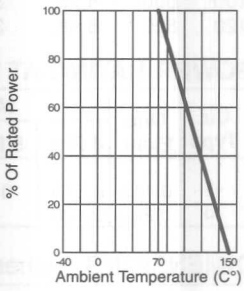
CIRCUIT 4



SURFACE TEMPERATURE RISE:



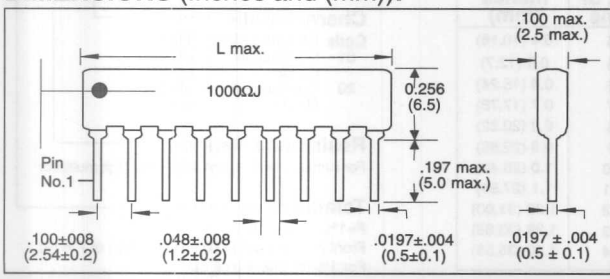
POWER DERATING:



POWER RATING AT 70°C:

Cir. Type	One Elem.	Maximum Power In One Network (watts)										
		4 Pin	5 Pin	6 Pin	7 Pin	8 Pin	9 Pin	10 Pin	11 Pin	12 Pin	13 Pin	14 Pin
-1	0.125	0.375	0.5	0.625	0.75	0.875	1	1.05	1.15	1.25	1.35	1.45
-3	0.250	0.500	-	0.750	-	1	-	1.05	-	1.25	-	1.45
-4	0.125	0.375	0.5	0.625	0.75	0.875	1	1.05	-	-	-	-

DIMENSIONS (Inches and (mm)):



No. Of Pins	L Max. Inches (mm)
4	0.40 (10.16)
5	0.53 (13.20)
6	0.63 (15.80)
7	0.73 (18.30)
8	0.83 (20.90)
9	0.93 (23.40)
10	1.03 (25.90)
11	1.13 (28.50)
12	1.23 (31.00)
13	1.33 (33.60)
14	1.40 (35.56)

HOW TO ORDER:

C 10 3 01 223 G

- IRC Type — C
- No. of Pins — 10
- Circuit Type — 3
- Characteristic — 01
- Resistance Range — 223
- Tolerance — G

Code	Classification	TCR
01	Commercial Grade	±100 ppm/°C
20	Commercial Grade	±200 ppm/°C

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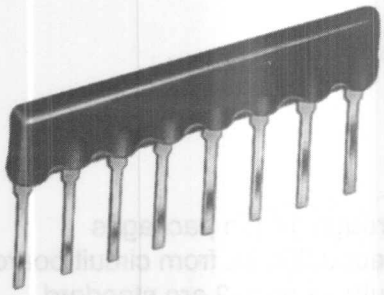
THICK FILM CONFORMAL COATED LOW PROFILE SIP NETWORK

ISO-9001 Registered

CL SERIES



- 4 through 11 pin packages
- Project 0.20 in. from circuit board
- Circuits -1 and -3 are standard

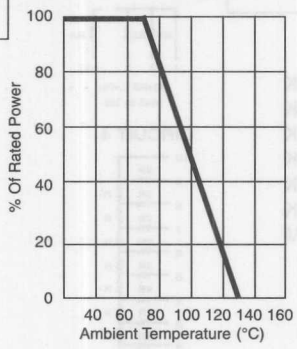
SPECIFICATIONS:

Physical		Environmental Per MIL-R-83401		Electrical	
Element:	Fused thick-film composition	**Short Time Overload:**	±0.5%	**Resistance Range (ohms):**	22 to 1.0M
Substrate:	96% alumina	**Terminal Strength:**	±0.5%	**Resistance Tolerance;**	±1%, ±2%, ±5%
Body:	Conformal coated	**Resistance to Solder Heat:**	±0.5%	**Temperature Coefficient:**	±100 ppm/°C (1% Tol.), ±200 ppm/°C
Terminals:	Solder plated steel	**Moisture Resistance:**	±2%	**Max. Continuous Working Voltage:**	100V
Lead Pull:	2.2 pounds	**Load Life:**	±2%	**Operating Temperature:**	-40°C to 125°C
Lead Solderability:	MIL-STD-202, method 210, cond. A	**Temperature Cycling:**	±0.5%		
Resistance to Soldering Heat:	MIL-STD-202, method 210, cond. A				
Marking Resistance to Solvents:	MIL-STD-202, method 215				

STANDARD RESISTANCE (OHMS):

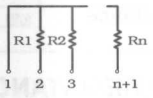
22	150	1K	6.8K	47K	330K
27	180	1.2K	8.2K	56K	390K
33	220	1.5K	10K	68K	470K
39	270	1.8K	12K	82K	560K
47	330	2.2K	15K	100K	680K
56	390	2.7K	18K	120K	820K
68	470	3.3K	22K	150K	1M
82	560	3.9K	27K	180K	
100	680	4.7K	33K	220K	
120	820	5.6K	39K	270K	

POWER DERATING:



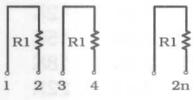
STANDARD CIRCUITS:

CIRCUIT 1 Bussed



R1+R2 ...=Rn
(n=3 to 13)

CIRCUIT 3 Isolated

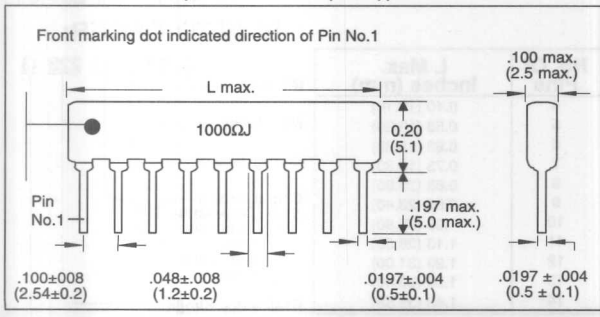


R1=R2...=Rn
(n=2 to 7)

POWER RATING AT 70°C

Cir. Type	One Elem.	Maximum Power In One Network (watts)								
		4 Pin	5 Pin	6 Pin	7 Pin	8 Pin	9 Pin	10 Pin	11 Pin	14 Pin
-1	0.125	0.375	0.5	0.625	0.75	0.875	1	1.05	1.15	1.45
-3	0.250	0.500	-	0.750	-	1	-	1.05	-	1.45

DIMENSIONS (Inches and (mm)):



No. of Pins	L Max. Inches (mm)
4	0.4 (10.16)
5	0.5 (12.7)
6	0.6 (15.24)
7	0.7 (17.78)
8	0.8 (20.32)
9	0.9 (22.86)
10	1.0 (25.40)
11	1.1 (27.94)
12	1.23 (31.00)
13	1.33 (33.68)
14	1.40 (35.56)

HOW TO ORDER:

When ordering R_2R_1 specify the value of R_1 (The 3 circuits will be marked with a letter 'S' preceding the resistance value)

Sample Part No.

CL 10 3 01 223 G

IRC Type — CL

No. of Pins (4 through 11) — 10

Circuit Type (1 & 3) — 3

Characteristic — 01

Code	Classification	TCR
01	Commercial Grade	±100 ppm/°C
20	Commercial Grade	±200 ppm/°C

Resistance Range — 223

For circuits 1 or 3, 2 digit range and digit multiplier

Tolerance — G

F=1%, G=2%, J=5%

Front marking dot indicates direction of Pin No.1

For 1% tol. use 4 digit mil

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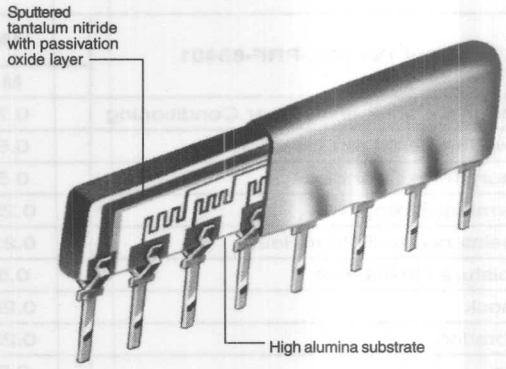
ECONOMICAL TANFILM® CONFORMAL COATED SIP NETWORK

ISO-9001 Registered

SMXX SERIES



- High precision
- Low profile
- High component density
- Superior TCR tracking
- 3 standard sizes
- Proven reliability
- Custom pin counts available

The economical solution to increasing precision resistor component density is IRC's commercial SMXX Series SIP Ultra Precision Resistor Network. This small footprint, conformally coated SIP features three (3) standard sizes (6, 8, 10 pin versions) in three (3) different circuit schematics and is only 0.250" high.

The real advantage of this package is the adaptation of our ultra stable Tantalum Nitide resistor film system to an economical solder assembly to provide the ultimate in precision and economy.

The TaNFilm® manufacturing process of sputtering tantalum nitride on to ceramic substrates ensures uniform temperature characteristics of all the resistors in the networks. The resistance film is then passivated to improve its stability and make it virtually impervious to environmental elements.

When you need high precision and ultimate reliability in a limited space, the TaNFilm® SM Series is the solution. This conformally coated SIP network can be tailored to meet special circuit configurations with multiple resistance values.

SPECIFICATIONS

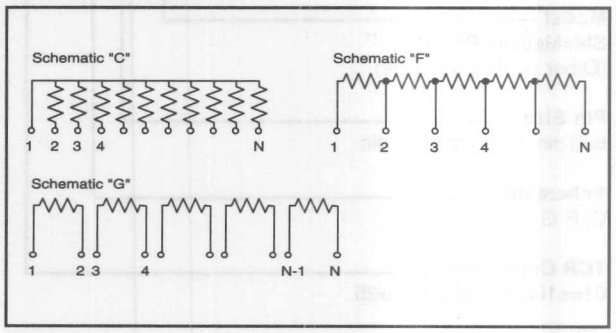
Resistance Ranges (Ohms)	Schematic C: 49.9 to 200K Schematic F: 20 to 200K Schematic G: 20 to 400K (Higher and lower resistance values available)
Standard Resistance Tolerance (±%)	0.1, 0.5, 1, 2 (0.05 available)
Temperature Coefficient of Resistance	Available to ±15 ppm/°C
TCR Tracking	±5 ppm/°C (except schematic C below 500 ohms 20 ppm/°C) ±2 ppm/°C available
Temperature Range	-55°C to +125°C
Noise Level	Less than -30 db
Lead Material	CDA 194 solder coated
Substrate Material	99.5% pure alumina ceramic
Construction	Epoxy conformal coated, solder assembled

POWER RATING AT 70°C

	Power Dissipation (Watts)			
		Network		
Schematic	Resistor	6 Pin	8 Pin	10 Pin
C, F	0.12	0.60	0.84	1.08
G	0.2	0.60	0.80	1.00

Custom circuits and special testing available.

STANDARD CIRCUITS



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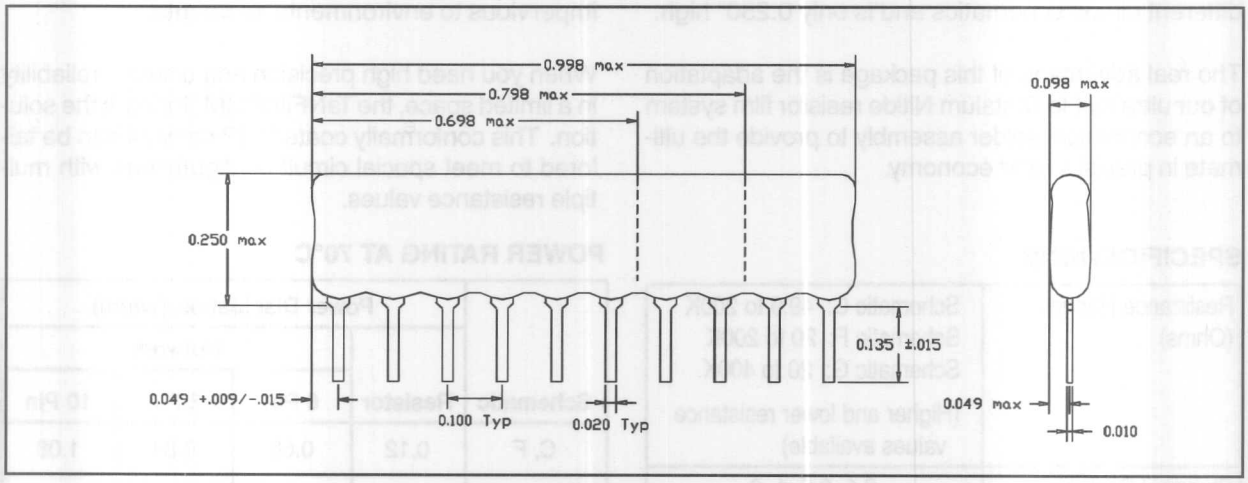
SMXX ENVIRONMENTAL TESTING

Test Per MIL-PRF-83401	MIL-PRF-83401 Limits (ΔR%)			TaNFilm Test Data (ΔR%)	
	M	K	H	Max.	Typical
Thermal Shock and Power Conditioning	0.7	0.7	0.5	0.25	0.05
Low Temperature Operation	0.5	0.25	0.1	0.1	0.05
Short Term Overload	0.5	0.25	0.1	0.1	0.05
Terminal Strength	0.25	0.25	0.25	0.1	0.05
Resistance to Solder Heat	0.25	0.25	0.1	0.1	0.05
Moisture Resistance	0.5	0.5	0.4	0.2	0.05
Shock	0.25	0.25	0.25	0.2	0.05
Vibration	0.25	0.25	0.25	0.2	0.05
Life	2.0	0.5	0.5	0.25	0.05
High Temperature Exposure	1.0	0.5	0.2	0.1	0.05
Low Temperature Storage	0.5	0.25	0.1	0.1	0.05
25°C Double Load	2.0	0.5	0.5	0.1	0.05

DIMENSIONS (Inches)



HOW TO ORDER

Sample Part No **BAS - SM8C - 03 - 1001 - B - X**

Family

Model
SM=Medium Profile
(Other profiles available)

Pin Size
6=6 pin; 8=8 pin; 0=10 pin

Schematic
C, F, G

TCR Code (ppm/°C)
01=±100; 02=±50; 03=±25

Ratio Tolerance to R_1
(if specified)

Absolute Tolerance
Standard MIL tolerance code

Absolute/Ratio Tolerance Code
A=±0.05%; B=±0.1%; C=±0.25%; D=±0.5%; F=±1.0%;G=±2.0%;

Resistance
Standard MIL resistance code.
Example: 1001 = 1000 ohms

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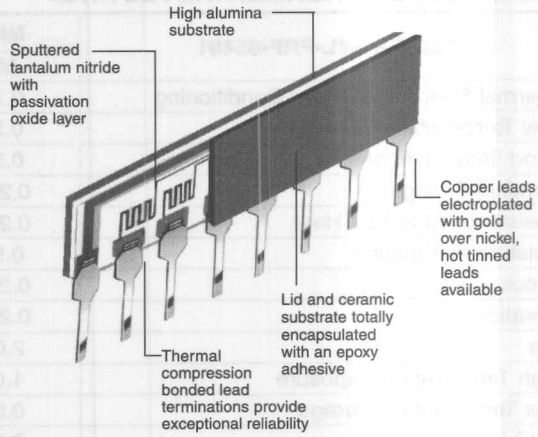
TANFILM® ULTRA PRECISION SIP NETWORK MIL-PRF-83401 QUALIFIED AND COMMERCIAL

ISO-9001 Registered

IRC

4700 SERIES



- High precision
- Low profile
- Absolute TCR to 10 ppm/°C
- Superior TCR tracking available to 2 ppm/°C
- 3 standard sizes
- Proven reliability
- Custom configurations available

IRC's 4700 series brings all of the TaNFilm® precision network benefits to the latest low profile MIL SIP configuration. Our SIP product line is qualified to 50 ppm/°C TCR and 0.1% tolerance. Absolute TCRs to 10 ppm/°C and tolerances to 0.01% can also be achieved using the same processes and equipment. Custom circuit configuration and screening is readily available when required.

The TaNFilm® manufacturing process of sputtering tantalum nitride on to ceramic substrates ensures uniform temperature characteristics of all the resistors in the network. The resistance film is then passivated to improve its stability and make it virtually impervious to environmental elements.

When you need high precision and ultimate reliability in a limited space, the TaNFilm® 4700 SIP series is the solution.

SPECIFICATIONS:

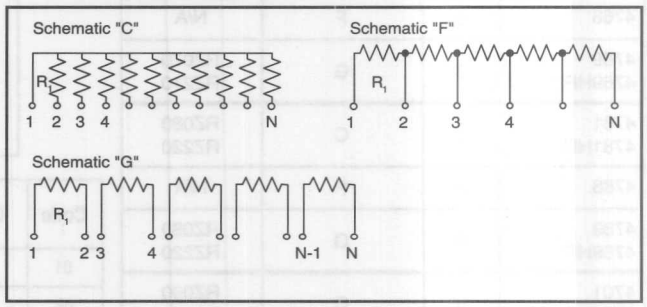
Resistance Ranges (Ohms)	MIL Qualified: Schematic C: 100 to 100K Schematic G: 100 to 100K Commercial: Schematic C: 49.9 to 200K Schematic F: 20 to 150K Schematic G: 20 to 400K (Higher and lower resistance values available)
Standard Resistance and Ratio Tolerance (±%)	0.05, 0.1, 0.25, 0.5, 1, 2 (0.01 available)
Temperature Coefficient [TCR (ppm/°C)]	MIL Qualified: ±50, ±100, ±300 Commercial: Available to ±15 ppm
TCR Tracking	5 ppm/°C (except schematic C below 500 ohms 20 ppm/°C) 2 ppm/°C available
Temperature Range	-55°C to +125°C
Noise Level	Less than -30 db
Lead Material	Gold plated nickel over copper
Substrate Material	99.6% pure alumina ceramic
Construction	Lid and ceramic substrate totally filled with an epoxy adhesive

Consult factory for any special features required.
Custom circuits and special testing available.

POWER RATING AT 70°C:

	Power Dissipation (Watts)			
		Network		
Schematic	**Resistor**	**6 Pin**	**8 Pin**	**10 Pin**
C, F (commercial or miltary)	0.12	0.60	0.84	1.08
G commercial military	0.2 0.12	0.60 0.36	0.80 0.48	1.00 0.60

STANDARD CIRCUITS:



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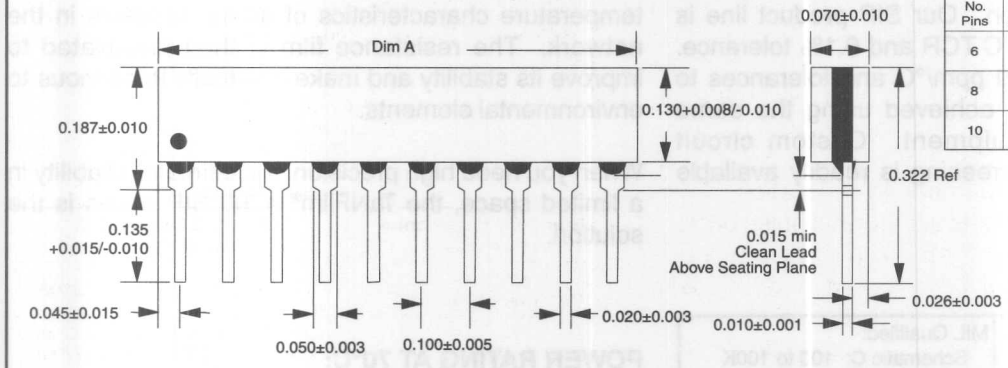
4700 SERIES ENVIRONMENTAL TESTING:

Test Per MIL-PRF-83401	MIL-PRF-83401 Limits (ΔR%)			TaNFilm Test Data (ΔR%)	
	M	K	H	Max	Typical
Thermal Shock and Power Conditioning	0.7	0.7	0.5	0.1	0.02
Low Temperature Operation	0.5	0.25	0.1	0.1	0.02
Short Term Overload	0.5	0.25	0.1	0.05	0.02
Terminal Strength	0.25	0.25	0.25	0.1	0.02
Resistance to Solder Heat	0.25	0.25	0.1	0.1	0.02
Moisture Resistance	0.5	0.5	0.4	0.1	0.02
Shock	0.25	0.25	0.25	0.1	0.02
Vibration	0.25	0.25	0.25	0.1	0.02
Life	2.0	0.5	0.5	0.1	0.02
High Temperature Exposure	1.0	0.5	0.2	0.1	0.02
Low Temperature Storage	0.5	0.25	0.1	0.1	0.02
25°C Double Load	2.0	0.5	0.5	0.05	0.02

DIMENSIONS (Inches):



No. Pins	IRC Model Number	Std. Mil Spec Style	Hi Rel Mil Style	Dim. A
6	476X	RZ070	RZ210	0.598
8	478X	RZ080	RZ220	0.798
10	470X	RZ090	RZ230	0.998

HOW TO ORDER:

Sample Part No. **SIP - 4781 - 03 - 1001 - B - X**

Model

Ratio Tolerance to R_1 (if specified)

Absolute Tolerance Code
A=±0.05%; B=±0.1%; C=±0.25%; D=±0.5%; F=±1.0%;G=±2.0%; J=±5%; Q=±0.02%; T=0.01%

Resistance
Standard MIL resistance code. Example: 1001 = 1000 ohms

Characteristic

Model	Pins	Schematic	MIL Type
4761 4761HR	6	C	RZ070 RZ210
4768	6	F	N/A
4769 4769HR	6	G	RZ070 RZ210
4781 4781HR	8	C	RZ080 RZ220
4788	8	F	N/A
4789 4789HR	8	G	RZ080 RZ220
4701 4701HR	10	C	RZ090 RZ230
4708	10	F	N/A
4709 4709HR	10	G	RZ090 RZ230

Code	Classification	TCR (ppm/°C)	Code	Classification	TCR (ppm/°C)
01	Commercial	100	06	MIL-PRF-83401	50
02	Commercial	50	07	Military Screened	25
03	Commercial	25	10	Commercial	20
04	MIL-PRF-83401	300	11	Commercial	15
05	MIL-PRF-83401	100	12	Commercial	10

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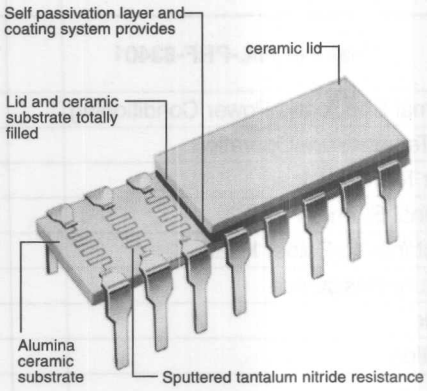
TANFILM® DIP RESISTOR NETWORK

ISO-9001 Registered

1900 SERIES



- MIL qualified to MIL-PRF-83401/01 & /02 and MIL-PRF-83401/13 & /14
- MIL spec qualified to 0.1% tolerance, ±0.02% available
- MIL spec qualified to ±50 ppm/°C, ±10 ppm/°C available
- Superior TCR tracking to ±2 ppm/°C
- Ratios available to ±0.01%
- Special mechanical and electrical configurations

TaNFilm® resistor networks are designed for use in applications requiring a high degree of reliability, stability, tight tolerance, close TCR tracking, and low noise. Our continuous feed, high vacuum sputtering process insures uniform properties from network to network. Precise state-of-the-art laser trimming enables us to easily zero in the tightest ratios. Gold-plated nickel copper leads are thermal pulse bonded to large-area gold pads on the ceramic substrate assuring the most reliable termination and long-term stability. Passivated tantalum nitride resistor material offers performance far superior to military specifications and excellent environmental protection.

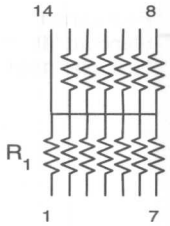
The versatile photo-etch process is adaptable to meet special customer requirements. Custom circuit designs and special mechanical configurations can be easily achieved with a modest set up charge. Full military screening is also available with all units.

Custom Circuits and special testing available. Contact factory for any special features required.

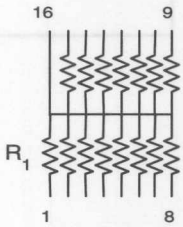
SPECIFICATIONS

Resistance Ranges (Ω)	**Mil Qualified:** Schematic A: 50 to 100K Schematic B: 50 to 100K **Commercial:** Schematic A: 50 to 400K Schematic B: 50 to 200K Higher and lower resistance values available		
Standard Resistance Tolerance (±%)	0.05, 0.1, 0.25, 0.5, 1, 2 (0.02 available)		
Temperature Coefficient (ppm/°C)	±10, ±15, ±25, ±50, ±100, ±300		
TCR Tracking	±5 ppm/°C, except Models 1987 and 1998 below 500Ω (±20 ppm/°C) ±2 ppm/°C available		
Temperature Range	-55°C to +150°C		
Noise Level	Less than -30 db		
Power Rating @ 70°C (watts)	Model	Resistor	Network
	1987	0.1	1.3
	1998	0.1	1.5
	1989	0.2	1.4
	1999	0.2	1.6
Lead Material	Gold Plated Nickel over Copper (Solder tin available)		
Substrate Material	99.6% pure alumina ceramic		
Construction	Ceramic sandwich epoxy encapsulant		

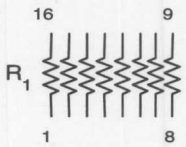
STANDARD CIRCUITS



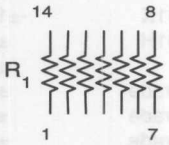
Model 1987
RZ010, RZ130
Schematic B



Model 1998
RZ020, RZ140
Schematic B



Model 1999
RZ020, RZ140
Schematic A



Model 1989
RZ010, RZ130
Schematic A

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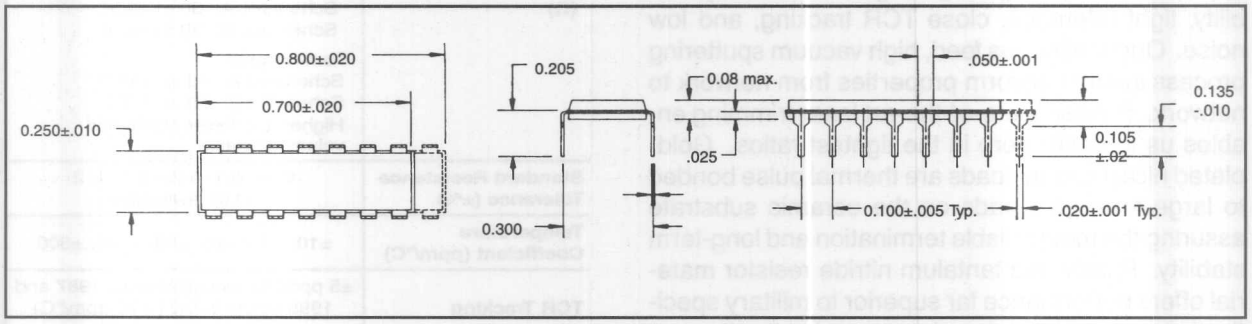
1900 SERIES ENVIRONMENTAL TESTING

Test Per MIL-PRF-83401	MIL-PRF-83401 Limits (ΔR%)			TaNFilm Test Data (ΔR%)	
	M	K	H	Max	Typical
Thermal Shock and Power Conditioning	0.7	0.7	0.5	0.1	0.02
Low Temperature Operation	0.5	0.25	0.1	0.1	0.02
Short Term Overload	0.5	0.25	0.1	0.05	0.02
Terminal Strength	0.25	0.25	0.25	0.1	0.02
Resistance to Solder Heat	0.25	0.25	0.1	0.1	0.02
Moisture Resistance	0.5	0.5	0.4	0.1	0.02
Shock	0.25	0.25	0.25	0.1	0.02
Vibration	0.25	0.25	0.25	0.1	0.02
Life	2.0	0.5	0.5	0.1	0.02
High Temperature Exposure	1.0	0.5	0.2	0.1	0.02
Low Temperature Storage	0.5	0.25	0.1	0.1	0.02
25°C Double Load	2.0	0.5	0.5	0.05	0.02

DIMENSIONS (Inches)



HOW TO ORDER

Sample Part No **DIP - 1999* - 06 - 1001 - B - X**

Family

Model

1989=MIL-PRF-83401/01 & /13, 14 Pin, Schematic A
1987=MIL-PRF-83401/01 & /13, 14 Pin, Schematic B
1999=MIL-PRF-83401/02 & /14, 16 Pin, Schematic A
1998=MIL-PRF-83401/02 & /14, 16 Pin, Schematic B

TCR Code (ppm/°C)

Code	Classification	TCR (ppm/°C)
01	Commercial Grade	±100
02	Commercial Grade	±50
03	Commercial Grade	±25
04	MIL-PRF-83401M	±300
05	MIL-PRF-83401K	±100
06	MIL-PRF-83401H	±50
07	MIL-Screened	±25
10	Commercial Grade	±20
11	Commercial Grade	±15
12	Commercial Grade	±10

*For High Rel styles RZ130 and RZ140 add "HR" after the model number.

Ratio Tolerance to R_1 (if specified)

Absolute Tolerance
Standard MIL tolerance code

Absolute/Ratio Tolerance Code
A=±0.05%; B=±0.1%; C=±0.25%; D=±0.5%; F=±1.0%;G=±2.0%; Q=±0.02%; T=0.01%

Resistance
Standard MIL resistance code.
Example: 1001 = 1000 ohms

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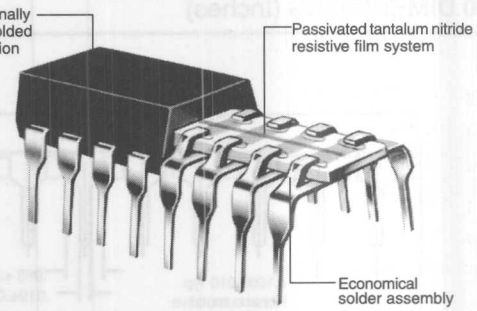
TANFILM® RESISTOR NETWORK PRECISION MOLDED DIP

ISO-9001 Registered

IRC

M900 SERIES



- Absolute tolerance to ±0.05%
- Absolute TCR to ±15 ppm/°C
- Superior TCR tracking to ±5 ppm/°C
- Ratios available to 0.05%
- Custom circuit schematics available

Molded TaNFilm® resistor networks are designed for use in applications requiring a high degree of reliability, stability, tight tolerance, close TCR tracking, and low noise. The molded construction provides excellent dimensional stability for automatic insertion. Our continuous feed, high vacuum sputtering process insures uniform properties from network to network. Precise state-of-the-art laser trimming enables us to easily zero in the tightest ratios. Passivated tantalum nitride resistor film ensures performance far superior to military specifications and provides excellent environmental protection.

The versatile nature of our photoetch process makes it possible to supply virtually any circuit configuration needed to meet special customer requirements. Custom circuit designs can be easily achieved with a modest set up charge. Military screening available on all units.

Custom Circuits and special testing available. Contact factory for any special features required.

SPECIFICATIONS

Resistance Ranges (Ω)	M959, M989 & M999	M954, M987 & M998
	10 to 400K	10 to 200K
Standard Resistance Ratio and Tolerance (±%)	0.1, 0.25, 0.5, 1 (0.05 available)	
Temperature Coefficient (ppm/°C)	±15, ±25, ±50, ±100, ±300	
TCR Tracking	±5 ppm/°C, except schematic B below 500Ω (±20 ppm/°C)	
Temperature Range	-55°C to +150°C	
Noise Level	Less than -30 db	
Substrate Material	99.5% pure alumina ceramic	
Construction	Molded epoxy	

	Model	Resistor	Network
Power Rating @ 70°C (watts)	M954	0.1	0.7
	M987	0.1	1.3
	M998	0.1	1.0
	M959	0.2	0.8
	M989	0.2	1.4
	M999	0.2	1.6

PERFORMANCE DATA

Test Per MIL-PRF-83401	MIL-PRF-83401 Limits (ΔR%)			TaNFilm Test Data (ΔR%)	
	M	K	H	Max	Typical
Thermal Shock and Power Conditioning	0.7	0.7	0.5	0.1	0.02
Low Temperature Operation	0.5	0.25	0.1	0.1	0.02
Short Term Overload	0.5	0.25	0.1	0.05	0.02
Terminal Strength	0.25	0.25	0.25	0.1	0.02
Resistance to Solder Heat	0.25	0.25	0.1	0.1	0.02
Moisture Resistance	0.5	0.5	0.4	0.1	0.02
Shock	0.25	0.25	0.25	0.1	0.02
Vibration	0.25	0.25	0.25	0.1	0.02
Life	2.0	0.5	0.5	0.1	0.02
High Temperature Exposure	1.0	0.5	0.2	0.1	0.02
Low Temperature Storage	0.5	0.25	0.1	0.1	0.02
25°C Double Load	2.0	0.5	0.5	0.05	0.02

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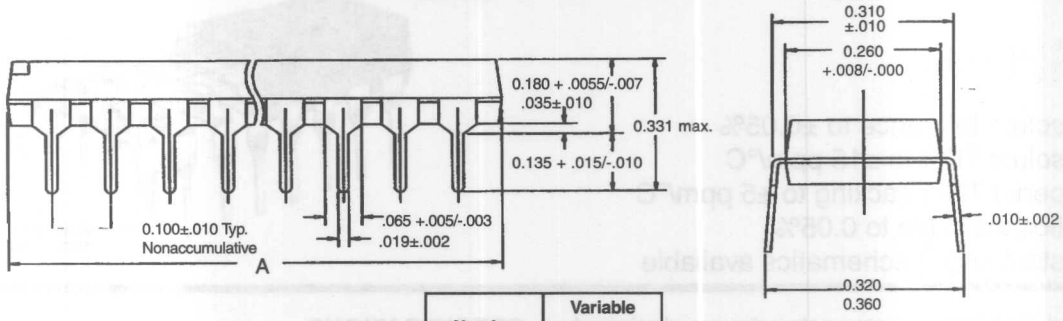
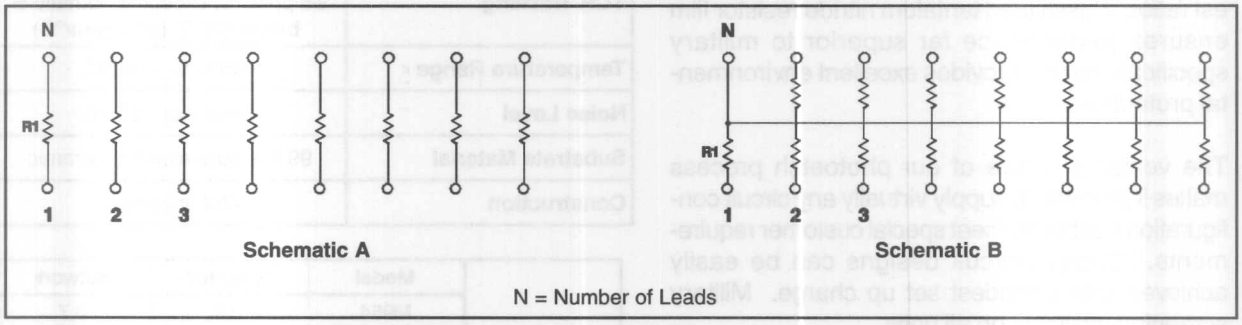
M900 DIMENSIONS (Inches)



Number of Pins	Variable Dimensions A Max.
8	0.465
14	0.765
16	0.865

SCHEMATICS



HOW TO ORDER

Sample Part No. **DPB M989 02 1001 B X**

Family — DPB

Model — M989

M959: 4 resistor, 8 pin DIP, straight thru
Schematic A
M954: 7 resistor, 8 pin DIP, one common lead
Schematic B

M989: 7 resistor, 14 pin DIP, straight thru
Schematic A
M987: 13 resistor, 14 pin DIP, one common lead
Schematic B

M999: 8 resistor, 16 pin DIP, straight thru
Schematic A
M998: 15 resistor, 16 pin DIP, one common lead
Schematic B

TCR Code (ppm/°C): 02
01 = ±100; 02 = ±50; 03 = ±25

Resistance 1001
Standard MIL resistance code.
Example: 1001 = 1000 ohms

Absolute Tolerance Code B

Absolute/Ratio Tolerance Code
A=±0.05%; B=±0.1%; C=±0.25%;
D=±0.5%; F=±1.0%;G=±2.0%;

Ratio Tolerance to R_1 X
(if specified)

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PRECISION HIGH-VOLTAGE THICK FILM RESISTORS

ISO-9001 Registered

CGH SERIES

- 1/4 watt to 5 watt
- 100K ohm to 2000 megohm range
- ±0.5%, ±1%, ±2% or ±5% tolerance
- TCR of ±50 or ±100 ppm/°C

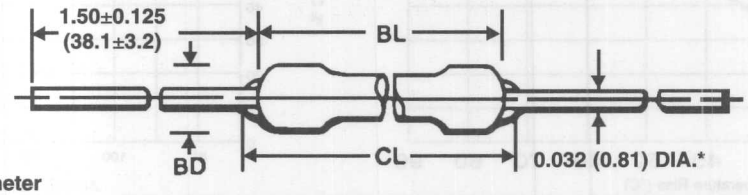
SPECIFICATIONS:

IRC Type	Power Rating @ 70°C (watts)[1]	Voltage Rating (volts)[2]	Resistance Range (ohms)[3]	Tol (±%)[4]	Maximum TCR (±ppm/°C)[4]	VCR (ppm/V)[5]
CGH-1/4	1/4	750	100K-100M	.5, 1, 2, 5	50, 100	0 to -5
CGH-1/2	1/2	1,500	100K-500M	.5, 1, 2, 5	50, 100	0 to -5
CGH-1	1	3,000	50K-750M	.5, 1, 2, 5	50, 100	0 to -5
CGH-2	2	5,000	100K-1500M	.5, 1, 2, 5	50, 100	0 to -5
CGH-3	3	10,000	200K-2000M	.5, 1, 2, 5	50, 100	0 to -5
CGH-5	5	20,000	300K-2000M	.5, 1, 2, 5	50, 100	0 to -5

NOTES:

1. For power rating above 70°C, see derating curve.
2. Voltage rating shown is the rated DC continuous working voltage or the sine-wave RMS absolute maximum voltage at commercial line frequency. For DC applications the absolute maximum permissible voltage is 1.5 times the value shown for low repetition short-time-overload or pulse conditions of 10 seconds or less duration.
3. Contact factory for higher resistance values.
4. For CGH-1 and 2 above 500 meg and CGH-3 and 5 above 1000M only 2 and 5% tolerance and 100 ppm/°C TCR available.
5. Typical voltage coefficient of resistance is -1 to -2 ppm/V measured at full rated voltage and 10% rated voltage.

DIMENSIONS (Inches and (mm)):



* CGH 1/4 leads are 0.025 (0.64) in diameter

IRC Type	Body Length - BL	Body Diameter - BD	Clean Lead to Clean Lead - CL
CGH-1/4	0.275±0.031 (6.98±0.79)	0.088±0.010 (2.22±0.25)	0.400 (10.16)
CGH-1/2	0.400±0.031 (10.16±0.79)	0.138±0.016 (3.51±0.41)	0.525 (13.34)
CGH-1	0.690±0.062 (17.53±1.57)	0.297±0.031 (7.54±0.79)	0.900 (22.86)
CGH-2	1.062±0.062 (26.97±1.57)	0.297±0.031 (7.54±0.79)	1.250 (31.75)
CGH-3	2.062±0.062 (52.37±1.57)	0.297±0.031 (7.54±0.79)	2.250 (57.15)
CGH-5	3.062±0.062 (77.77±1.57)	0.297±0.031 (7.54±0.79)	3.250 (82.55)

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IRC

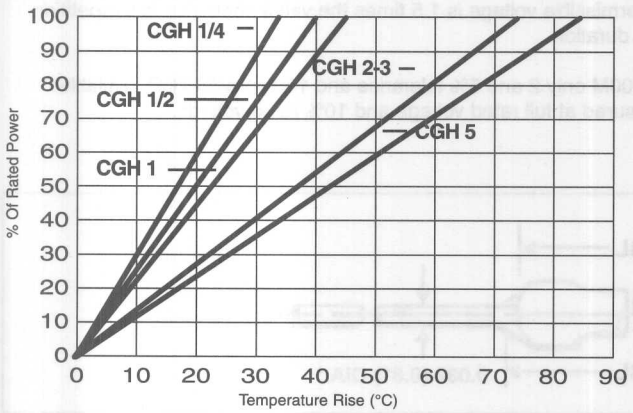
CGH ENVIRONMENTAL PERFORMANCE:

TEST CONDITION[1]	Maximum ΔR (±3σ)	Typical[2] ΔR
Temperature Shock	±0.25%	±0.10%
Short-Time Overload (1.5 times rated V for 10 sec)	±0.20%	±0.10%
Solder Effect	±0.015%	±0.05%
Terminal Strength	±0.20%	±0.05%
Moisture Resistance (no load or polar)	±0.50%	±0.20%
Load Life (1000 Hours at 70°C)	±1.00%	±0.25%
Shelf Life (1 year at 25°C)	±0.10%	±0.03%
High -Temperature Exposure (150°C for 2000 Hours)	±0.75%	±0.30%
(175°C for 2000 Hours)	±1.0%	±0.40%
Dielectric Breakdown[3] (1/4 and 1/2 watt size)	2000 VDC, 1500 VAC	
(1 watt through 5 watt size)	3500 VDC, 2500 VAC	
Dielectric Strength[4]	±0.15%	±0.05%
Insulation Resistance at 500 VDC	10^9 ohms min.	10^{11} ohms typ.

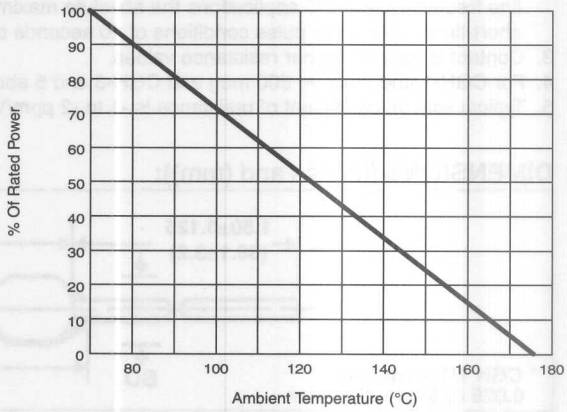
NOTES:

1. Test method per MIL-STD-202 unless otherwise indicated
2. Typical defined as that percent change which will include a minimum of 50% of the measured changes in resistance from a variety of lots representing various unit sizes and ranges
3. Values shown are the maximum safe dielectric voltage applied from a V block or foil wrapping which extends the complete body length of the resistor under test
4. Percent change after the maximum safe dielectric voltage is applied for 1 minute

TEMPERATURE RISE:



POWER DERATING:



HOW TO ORDER:

Sample Part No.: **CGH 3 - 50ppm/°C - 2205 (22M) - 1%**

IRC Type
CGH 1/4, CGH 1/2, CGH 1, CGH 2, CGH 3, CGH 5

Temperature Coefficient
±100 ppm/°C, ±50 ppm/°C

Resistance
Standard EIA/MIL values for metal film resistors. See specification chart on back inside cover for range.

Tolerance
±0.5%, ±1%, ±2%, ±5%

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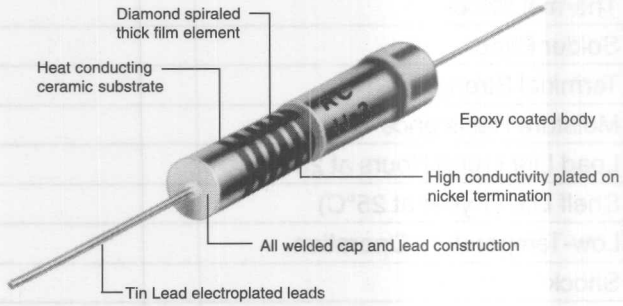
THICK FILM HIGH VOLTAGE/HIGH RELIABILITY MIL-APPROVED METAL GLAZE™ RESISTORS

ISO-9001 Registered

IRC

CMH SERIES



- 1/4 watt to 5 watt
- 330K ohm to 1G ohm range
- ±1%, ±2%, or ±5% tolerance
- TCR of ±100 ppm/°C
- Qualified to MIL-R-49462

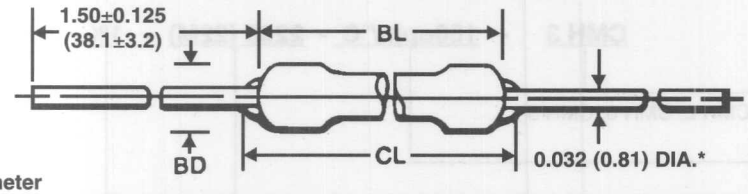
SPECIFICATIONS:

IRC Type	MIL Type[3]	Power Rating@ 70°C (watts)[1]	Voltage Rating (volts)[2]	Resistance Range (ohms)[4]	Tolerance (±%)	Maximum TCR (±ppm/°C)[4]	VCR (ppm/V)
CMH-1/4	RHV30	1/4	750	330K-100M	1, 2, 5	100	0 to -5
CMH-1/2	RHV31	1/2	1,500	330K-392M	1, 2, 5	100	0 to -5
CMH-1	RHV32	1	3,000	330K-499M	1, 2, 5	100	0 to -5
CMH-2	RHV33	2	5,000	330K-499M	1, 2, 5	100	0 to -5
CMH-3	RHV34	3	10,000	330K-1000M	1, 2, 5	100	0 to -5
CMH-5	RHV35	5	20,000	330K-1000M	1, 2, 5	100	0 to -5

NOTES:

1. For power rating above 70°C, see derating curve.
2. Voltage rating shown is the rated DC continuous working voltage or the sine-wave RMS absolute maximum voltage at commercial line frequency.
3. Marked per MIL-R-49462
4. Values greater than 100 meg and less than 500 meg, ±200ppm; values greater than or equal to 500 meg, ±500ppm.

DIMENSIONS (Inches and (mm)):



* CMH 1/4 leads are 0.025 (0.64) in diameter

IRC Type	Body Length - BL	Body Diameter - BD	Clean Lead to Clean Lead - CL
CMH-1/4	0.275±0.031 (6.98±0.79)	0.088±0.010 (2.22±0.25)	0.400 (10.16)
CMH-1/2	0.400±0.031 (10.16±0.79)	0.138±0.016 (3.51±0.41)	0.525 (13.34)
CMH-1	0.690±0.062 (17.53±1.57)	0.297±0.031 (7.54±0.79)	0.900 (22.86)
CMH-2	1.062±0.062 (26.97±1.57)	0.297±0.031 (7.54±0.79)	1.250 (31.75)
CMH-3	2.062±0.062 (52.37±1.57)	0.297±0.031 (7.54±0.79)	2.250 (57.15)
CMH-5	3.062±0.062 (77.77±1.57)	0.297±0.031 (7.54±0.79)	3.250 (82.55)

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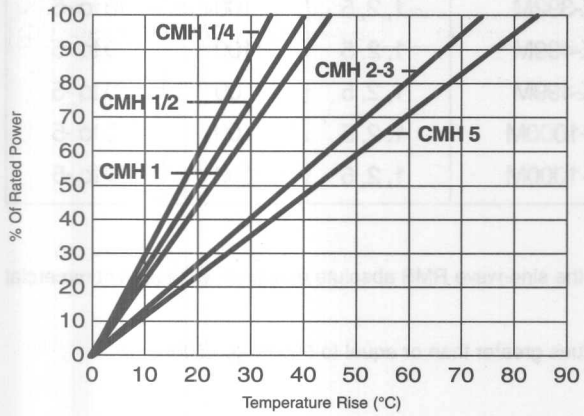
CMH ENVIRONMENTAL PERFORMANCE:

TEST CONDITION*	Maximum ΔR (±3σ)	Typical ΔR
Thermal Shock	±0.25%	±0.10%
Solder Effect	±0.15%	±0.05%
Terminal Strength	±0.20%	±0.10%
Moisture Resistance	±0.50%	±0.20%
Load Life (1000 Hours at 25°C)	±1.00%	±0.25%
Shelf Life (1 year at 25°C)	±0.10%	±0.03%
Low-Temperature Operation	±0.15%	±0.05%
Shock	±0.35%	±0.10%
Vibration	±0.35%	±0.10%
Dielectric Strength	±0.15%	±0.05%
Insulation Resistance at 500 VDC	$\pm 10^{9}\Omega$ min	$5 \times 10^{12}\Omega$ typ

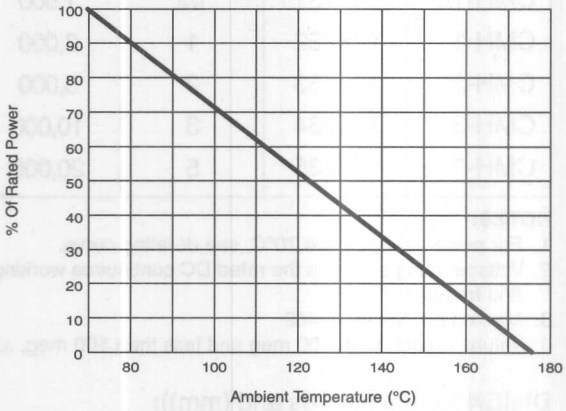
NOTES:

* Test per MIL-R-49462 and Mil Std-202.

TEMPERATURE RISE:



POWER DERATING:



HOW TO ORDER:

Sample Part No.: **CMH 3 - 100ppm/°C - 2205 (22M) - 1%**

IRC Type
CMH 1/4, CMH 1/2, CMH 1, CMH 2, CMH 3, CMH 5

Temperature Coefficient
±100 ppm/°C

Resistance
Standard MIL values for metal film resistors. See specification chart on back inside cover for range.

Tolerance
±1%, ±2%, ±5%

WIREWOUND AND FILM TECHNOLOGIES DIVISION
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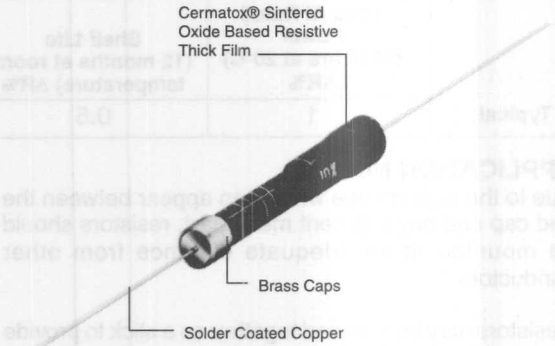
HIGH VOLTAGE THICK FILM RESISTOR

ISO-9001 Registered

F SERIES



- Working voltage up to 28KV
- Wide resistance range
- Good resistance stability
- Termination variants
- Sets available with matched characteristics
- Good ratio matching over wide voltage range
- Series connection of resistors by screw terminals

SPECIFICATIONS:

IRC Type	Power Rating at 20°C (watts)	Resistance Range (ohms)	Limiting Element Voltage (volts)		TCR (ppm/°C) (values>1G: TCR is 250ppm/°C)	Resistance Tolerance (%) (measured at 100 volts dc)	Values (any value to special order)	Thermal Impedance (°C/watt)	Operating Temperature Range (°C)
			In Air	In Oil					
F43	0.7	2M to 100G	4K	8K	-2000	2, 5, 10	EIA 2%	44	-55 to 100
F44	1.3	2M to 150G	14K	28K	-2000	2, 5, 10	values preferred	33	-55 to 100

CONSTRUCTION:
The Cermatox® sintered oxide based resistive thick film is fired onto the surface of a high quality ceramic onto which turned brass end caps are pressed. A helical cut is made into the film to adjust its ohmic value and finally a sleeve is fitted to provide mechanical protection and electrical insulation. Resistors for use in oil or SF_6 can be supplied with a lacquer protection instead of the sleeve.

TERMINATIONS:
Three styles of termination are available to permit resistors to be screwed together in a series chain, with the end members having axial wires for soldering.

Wire Terminations: Styles D and KU. See illustration.

Material: Solder-coated copper wire.

Screw Terminations: Styles TU and KU. See illustration.

Material: Turned brass

Screw Thread: All caps are tapped UNF-10 x 4.2 deep. UNF-10 is 32 TPI, 60° thread angle 4.72±0.07 mm outside diameter, 3.83 mm core diameter.

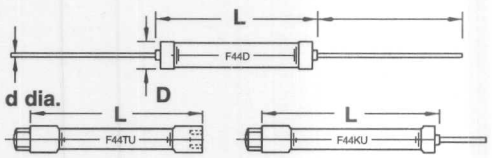
Coupling Stud: All KU & TU resistors are supplied with 8 mm long screwed brass studs.

MARKING:
Type reference, resistance value, tolerance and data code are legend marked.

SOLVENT RESISTANCE:
The lacquer and protective sleeve provide excellent resistance to all normal industrial cleaning solvents suitable for printed circuits.

DIMENSIONS (Inches and (mm)):

Type	L max	D max	T min	d nom	PCB mounting centers	Min Bend Radius	Weight nom (g)
F43D	1.00 (25.4)	0.330 (8.4)	1.260 (32.0)	0.031 (0.8)	1.252 (31.8)	0.047 (1.2)	3.1
F44D	2.0 (50.8)	0.330 (8.4)	1.260 (32.0)	0.031 (0.8)	2.252 (57.2)	0.047 (1.2)	5.6
F43KU	1.19 (30.2)	0.335 (8.5)	1.260 (32.0)	0.031 (0.8)			3.9
F44KU	2.09 (53.2)	0.335 (8.5)					7.4
F43TU	1.28 (32.6)	0.335 (8.5)					5.8
F44TU	2.19 (55.6)	0.335 (8.5)					8.2



ISO-9001 Registered

IRC

F SERIES PERFORMANCE DATA:

	Load At Rated Power (1000 hrs at 20°C) ΔR%	Shelf Life (12 months at room temperature) ΔR%	Derating From Rated Power at 20°C	Noise (μV/V in decade of frequency)	Voltage Coefficient of Resistance (ppm/volt)
Typical	1	0.5	zero at 100°C	<2.5	<25

APPLICATION NOTES:

Due to the high voltage which can appear between the end cap and any adjacent metal part, resistors should be mounted at an adequate distance from other conductors.

Resistors may be screwed together as a stick to provide an assembly which will be capable of withstanding any desired voltage, providing no individual resistor is subjected to a greater stress or power dissipation than is recommended in this data sheet.

For some high voltage applications it is required to immerse the components in oil or gas to reduce the effects of corona and surface tracking. A special lacquer is available, suitable for immersion in transformer oil or SF6. When resistors are required to be potted, the preferred encapsulant is a silicone compound.

For voltage dividers with a low resistance section below the minimum available value of an F43 resistor, it is entirely suitable to use an RC Series resistor, available down to 1 ohm.

MATCHED SETS:

Matched sets can be supplied for use as voltage dividers. These may be screwed together to form sticks and, by selecting the KU type of termination, a wire connection can be provided at each end of the stick.

Inquiries are welcome for special resistors and sets when resistor length, operating voltage or resistance values is outside the catalog range.

HOW TO ORDER:

Specify type reference etc. as indicated in this example of type F44KU 6.8 ohms ±2% resistor.

F44 KU 6M8 G

Type — F44

Termination — KU

Value — 6M8

Tolerance — G

G=2%, J=5%, K=10%

Packaging: Bulk = 25 pieces per box

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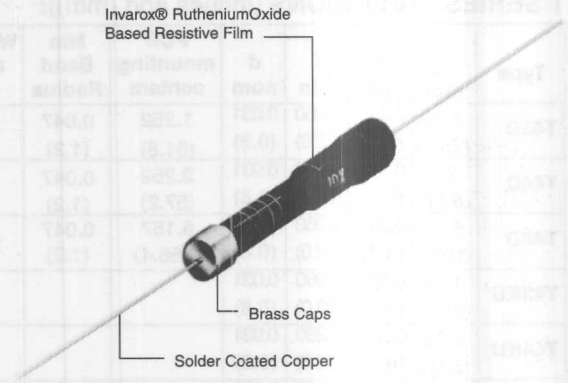
HIGH VOLTAGE PRECISION THICK FILM RESISTOR

ISO-9001 Registered

T SERIES



- Working voltage up to 100KV
- Wide resistance range
- Low temperature coefficient of resistance
- Low voltage coefficient
- Termination variants
- Sets available with matched characteristics
- Excellent ratio matching
- Series connection of resistors by screw terminals

SPECIFICATIONS:

IRC Type	Power Rating at 20°C (watts)	Resistance Range (ohms)	Limiting Element Voltage (volts)		TCR (ppm/°C) (values>1G: TCR is 250ppm/°C)	Resistance Tolerance (%) (measured at 100 volts dc)	Values (any value to special order)	Thermal Impedance (°C/watt)	Operating Temperature Range (°C)
			In Air	In Oil					
T43	1.5	1K to 4G	4K	8K	25, 50, 100	1, 2, 5	EIA 2% values preferred	31	-55 to 100
T44	3.5	1K to 15G	14K	28K				27	
T48	10	1K to 45G	50K	100K				13	

CONSTRUCTION:
The Invarox® ruthenium oxide based resistive film is fired into the surface of a high quality ceramic onto which turned brass end caps are pressed. A helical cut is made into the film to adjust its resistive value and finally a protective sleeve is fitted to provide mechanical protection and electrical insulation. Resistors for use in oil or SF_6 can be supplied with a lacquer protection instead of the sleeve.

TERMINATIONS:
Three styles of termination are available to permit resistors to be screwed together in a series chain, with the end members having axial wires for soldering.

Wire Terminations: Styles D and KU. See illustration.

Material: Solder-coated copper wire.

Screw Terminations: Styles TU and KU. See illustration.

Material: Turned brass

Screw Thread: All caps are tapped UNF-10 x 4.2 deep. UNF-10 is 32 TPI, 60° thread angle 4.72±0.07 mm outside diameter, 3.83 mm core diameter.

Coupling Stud: All KU & TU resistors are supplied with 8 mm long screwed brass studs.

MARKING:
Type reference, resistance value, tolerance and data code are legend marked.

SOLVENT RESISTANCE:
The lacquer and protective sleeve provide excellent resistance to all normal industrial cleaning solvents suitable for printed circuits.

PERFORMANCE DATA:

	Load At Rated Power (1000 hrs at 20°C) ΔR%	Shelf Life (12 months at room temperature) ΔR%	Derating From Rated Power at 20°C	Noise (μV/V in decade of frequency)	Voltage Coefficient of Resistance (ppm/volt)
Typical	0.3	0.3	zero at 150°C	<2.5	<1

APPLICATION NOTES:

Due to the high voltage which can appear between the end cap and any adjacent metal part, resistors should be mounted at an adequate distance from other conductors.

Resistors may be screwed together as a stick to provide an assembly which will be capable of withstanding any desired voltage, providing no individual resistor is subjected to a greater stress or power dissipation than is recommended in this data sheet.

For some high voltage applications it is required to immerse the components in oil or gas to reduce the effects of corona and surface tracking. A special lacquer is available, suitable for immersion in transformer oil or SF6. When resistors are required to be potted, the preferred encapsulant is a silicone compound.

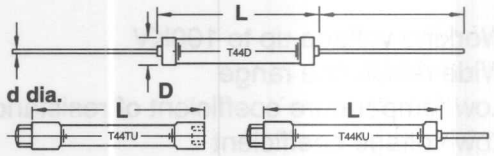
For voltage dividers with a low resistance section below the minimum available value of an F43 resistor, it is entirely suitable to use an RC Series resistor, available down to 1 ohm.

ISO-9001 Registered

IRC

T SERIES DIMENSIONS (Inches and (mm)):

Type	L max	D max	T min	d nom	PCB mounting centers	Min Bend Radius	Weight nom (g)
T43D	1.00 (25.4)	0.330 (8.4)	1.260 (32.0)	0.031 (0.8)	1.252 (31.8)	0.047 (1.2)	3.1
T44D	2.0 (50.8)	0.330 (8.4)	1.260 (32.0)	0.031 (0.8)	2.252 (57.2)	0.047 (1.2)	5.6
T48D	5.91 (150.0)	0.330 (8.4)	1.260 (32.0)	0.031 (0.8)	6.157 (156.4)	0.047 (1.2)	18.5
T43KU	1.19 (30.2)	0.335 (8.5)	1.260 (32.0)	0.031 (0.8)			3.9
T44KU	2.09 (53.2)	0.335 (8.5)	1.260 (32.0)	0.031 (0.8)			7.4
T48KU	6.00 (152.2)	0.335 (8.5)	1.260 (32.0)	0.031 (0.8)			19.3
T43TU	1.28 (32.6)	0.335 (8.5)					5.8
T44TU	2.19 (55.6)	0.335 (8.5)					8.2
T48TU	6.09 (154.8)	0.335 (8.5)					20.2



MATCHED SETS:

Matched sets can be supplied for use as voltage dividers. These may be screwed together to form sticks and, by selecting the KU type of termination, a wire connection can be provided at each end of the stick.

Enquires are welcome for special resistors and sets when resistor length, operating voltage or resistance values is outside the catalog range.

HOW TO ORDER:

Specify type reference etc. as indicated in this example of type T44KU 6.8 ohms ±2% resistor.

T44 KU 6M8 G 50

Type — T44

Termination — KU

Value — 6M8

Tolerance — G

G=2%, J=5%, K=10%

TCR (ppm/°C) — 50

Packaging: Bulk = 25 pieces per box

WIREWOUND AND FILM TECHNOLOGIES DIVISION
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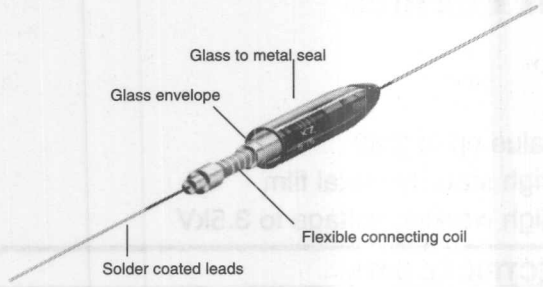
ULTRA-HIGH VALUE PRECISION RESISTOR

ISO-9001 Registered

3810 SERIES



- Resistance range up to 100T ohms (10^{14} ohms)
- Low voltage
- Hermetically sealed
- Designed for low current (pica ampere level) measurements
- Leakage current minimised by hermetic sealing and guard ring

SPECIFICATIONS:

IRC Type	Resistance Range (ohms)	Limiting Element Voltage (volts)	TCR (20°C - 70°C) ppm/°C	Resistance Tolerance (%)	Values	Operating Temperature Range (°C)	Voltage Coefficient of Resistance (measured at voltages of 100 & 500 volts) ppm/volt		
							100MΩ	1TΩ	100TΩ
3810	100M TO 1T	500	-500 to -3500	10, 20	EIA 2% values preferred	-40 to 100	-20	-160	
3811	100M TO 1T	1000		1, 2, 5, 10			-10	-80	-150
3812	1T TO 100T	1000		2, 5, 10			-10	-80	-150

CONSTRUCTION: The Cermetox® resistive film is fired onto a high quality ceramic substrate; brass end caps are force fitted to the substrate which is then adjusted to value with a helical cut in the film; the leads are mechanically locked into the end caps and the assembly sealed into the glass envelope.

All close tolerance units utilize two resistors connected in series within the glass envelope. High value units, type 3812, are part filled with silicone oil. The guard band is described, with application notes, in a Product Information sheet, available on request.

TERMINATIONS: Solder-coated dumet wire.

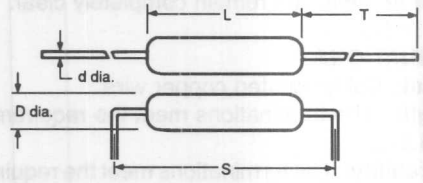
MARKING: Type reference, TCR code, resistance value and tolerance code are legend marked. Resistance value marking conforms to IEC 62.

SOLVENT RESISTANCE: The glass envelope is coated with silicone and should not be subjected to solvents or their vapors. (See application notes.)

PACKAGING: Each resistor is individually packed in a polythene envelope together with a card carrying measurement details and serial number. (See application notes.)

DIMENSIONS (Inches and (mm)):

Type	L max	D max	T min	d nom	S min	Weight nom (g)
3810	0.984 (25.0)	0.236 (6)	1.181 (30)	0.024 (0.6)	1.220 (31)	1.5
3811	1.689 (42.9)	0.236 (6)	1.181 (30)	0.024 (0.6)	1.929 (49)	2.2
3812	1.890 (48.0)	0.236 (6)	1.181 (30)	0.024 (0.6)	2.126 (54)	2.5



PERFORMANCE DATA:

	Load At Rated Voltage (1000 hrs at 20°C) ΔR%	Shelf Life (12 months at room temperature) ΔR%	Resistance To Solder Heat ΔR%	Inductance	Capacitance pF	
					3810	3811
Typical	1	0.5	<0.1	Low inductance versions available in the range100M to 1T	0.4	0.2

APPLICATION NOTES:

Each resistor is packed with a card stating nominal resistance value at 100 V applied, selection tolerance, date and serial number. Although the glass envelope is an excellent insulant and would be adequate in a dry atmosphere, the condensation which occurs in a normal atmosphere will provide a shunt resistance which will modify the very high resistance value. To minimise this effect all units are coated with silicone, and it is essential that this coating is not damaged; any handling should be by the terminations. For the same reason solvents must not be used. The resistors should not be used in a damp atmosphere. If moisture develops on the body the resistor should be dried for 30 minutes at 70°C and allowed to cool for a further 30 minutes in a dry atmosphere.

To avoid damage to the seal between terminations and glass, the leads must be fully supported inside the point of bending during any preforming operation.

Guard Band: For details of how to use the guard band, fitted to resistors of 100GΩ and over, ask for Product Information Sheet No. 32.

Non-standard Versions: Units without the glass envelope but withlacquer protection are available, but will have a limited electrical performance. Measured values at a voltage other than 100V may be recorded.

For non-standard items contact IRC Resistors.

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HIGH VOLTAGE METAL FILM RESISTOR

ISO-9001 Registered

MH SERIES

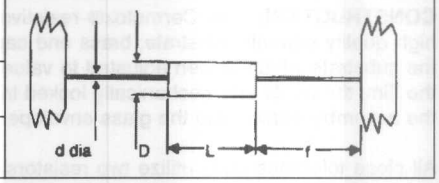
- Value up to 2M2
- High stability metal film
- High working voltage to 3.5kV

ELECTRICAL DATA

		MH25	MH37
Power rating at 70°C	watts	0.25	0.50
Resistance range	ohms	100K - 2M2	100K - 1M0
Limiting element voltage	volts dc or ac peak	1,600	3,500
Isolation voltage	volts	700	
TCR (20° to 70°C)	ppm/°C	100	
Resistance tolerance	%	1, 2, 5	
Standard values		E24 and E96 preferred	
Thermal impedance	°C/watt	140	112
Operating temperature range	°C	-55 to 155	

PHYSICAL DATA

DIMENSIONS (mm) and WEIGHT (g)						
TYPE	L max	D max	f min	d nom	PCB mounting centers	Min bend radius
MH25	6.2	2.3	21.0	0.6	10.2	0.6
MH37	9.0	3.7	19.6	0.8	12.7	1.2



CONSTRUCTION

Thin film material is sputtered onto high grade ceramic rods. Nickel plated steel caps are force fitted and the termination wires are welded to the caps. The value is obtained by a helical cut in the film and finally the resistor body is protected by a cement protection applied so that the terminations remain completely clear.

TERMINATIONS

Material: Solder-coated copper wire.
Strength: The terminations meet the requirements of IEC 68.21.
Solderability: The terminations meet the requirements of IEC 115-1 Clause 4.17.3.2.

MARKING

1% tolerance resistors are colour coded with 5 bands. 2% and 5% tolerance have 4. IEC 62 colours are used.

SOLVENT RESISTANCE

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed boards.

		Performance	
		Maximum	Typical
Load at rated voltage: 1000 hours at 70°C	ΔR	1.5	0.4
Derating		Zero at 155°C	
Overload	ΔR	1.0	0.25
Dry heat: 16 hrs at 155°C	ΔR	1.5	0.2
56 days DHSS	ΔR	1.5	0.2
Climatic	ΔR	1.5	0.2
Climatic category		55/155/56	
Temperature rapid change	ΔR	0.5	0.05
Resistance to solder heat	ΔR	0.5	0.05
Vibration and bump	ΔR	0.5	0.05
Voltage proof	volts	700 min	

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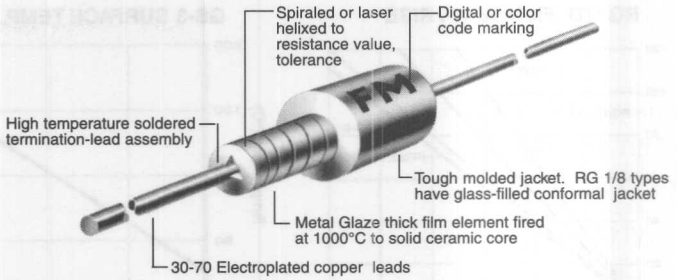
PRECISION NON MILITARY METAL GLAZE™ RESISTORS

ISO-9001 Registered

IRC

RG SERIES



- 1/8 watt to 3 watts
- 0.4 ohm to 5.1 megohms
- 0.5% to 5% tolerance; 0.1% in selected ranges
- ±25 ppm/°C to ±200 ppm/°C

SPECIFICATIONS:

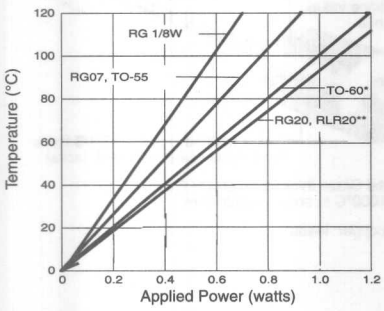
IRC TYPE	MIL TYPE	Marking	Tol (±%)	T.C. (ppm/°C)	IRC Power Rating (watts @ °C)	Max. Volt. Rtg.	IRC Resistance Range (Ω)	Nominal Size	Dimension Code
RG 1/8[1]	-	Band	2, 5	200	1/4 @ 70	200	4.3 to 1.5M	1/8W	1
RG 1/4	-	Band	5	200	1/2 @ 70[5]	250[6]	4.3 to 5.1M	1/4W	2
RG 1/2	-	Band	5	200	1 @ 70	350	4.3 to 5.1M	1/2W	3
TO-50[1]	-	Stamp	.5, 1	100	1/4 @ 70	200	10 to 1M	1/8W	1
T2-50[1]	-	Stamp	.5, 1	50	1/8 @ 70	200	10 to 1M	1/8W	1
T9-50[1]	-	Stamp	.5, 1	25	1/8 @ 70	200	10 to 1M	1/8W	1
TF-05[1]	-	Band/Stamp	1, 2, 5	100	1/4 @ 70	200	.4 to 9.9	1/8W	1
TF-07	-	Band/Stamp	1, 2, 5	100	1/2 @ 70	250	.4 to 9.9	1/4W	2
TF-20	-	Band/Stamp	1, 2, 5	100	1 @ 70	250	.4 to 9.9	1/2W	3
GF-55	Flame Resist[2]	Stamp	1	50[4], 100	1/2 @ 70	250	.4 to 2M	1/4W	2
GF-07	Flame Resist[2]	Stamp	2, 5	100	1/2 @ 70	250	.4 to 2M	1/4W	2
GF-60	Flame Resist[2]	Stamp	1	50[4], 100	3/4 @ 70	350	.4 to 2M	1/2W	4
GF-20	Flame Resist[2]	Stamp	2, 5	100	3/4 @ 70	350	.4 to 2M	1/2W	4
GF-3	Flame Resist[2]	Stamp	1, 2, 5	200	2 @ 70 3 @ 70	750	1 to 2M	3W	5
GS-3	-	Stamp	1, 2, 5	50[4], 100	2 @ 70 3 @ 70	1000	1 to 3M	3W	5
RG-07	-	Band	2, 5	200	1/2 @ 70	250	4.3 to 5.1M	1/4W	2
RG-20	-	Band	2, 5	200	1 @ 70	350	4.3 to 5.1M	1/2W	3
TO-55	-	Band/Stamp	.1, .5, 1[3]	100	1/2 @ 70	200	10 to 3.01M	1/4W	2
T2-55	-	Stamp	.1, .5, 1[3]	50	1/4 @ 70	200	10 to 3.01M	1/4W	2
T9-55	-	Stamp	.1, .5, 1[3]	25	1/4 @ 70	200	10 to 3.01M	1/4W	2
T0-60	-	Band/Stamp	.1, .5, 1[3]	100	3/4 @ 70	300	10 to 3.01M	1/2W	4
T2-60	-	Stamp	.1, .5, 1[3]	50	1/2 @ 70	250	10 to 3.01M	1/2W	4
T9-60	-	Stamp	.1, .5, 1[3]	25	1/2 @ 70	250	10 to 3.01M	1/2W	4

1. Conformally coated construction on all 1/8W nominal size resistors.
2. Contact factory for details on flame-resistant specifications.
3. Only available in F tolerance above 2M ohm.
4. Below 10 ohms only available in 100 ppm.
5. 1 Watt @ 70°C available - see page 87.
6. Contact factory for details on higher voltage rating.

ISO-9001 Registered

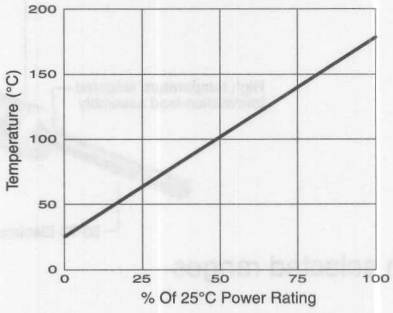
PERFORMANCE DATA:

RG 'TO' FILM TEMP. RISE

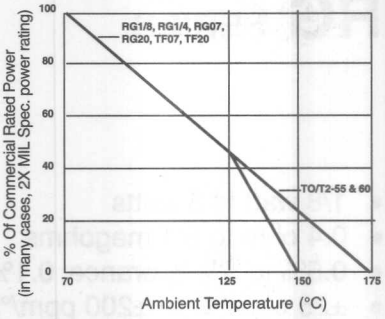


*0.025 inch leads **0.032 inch leads

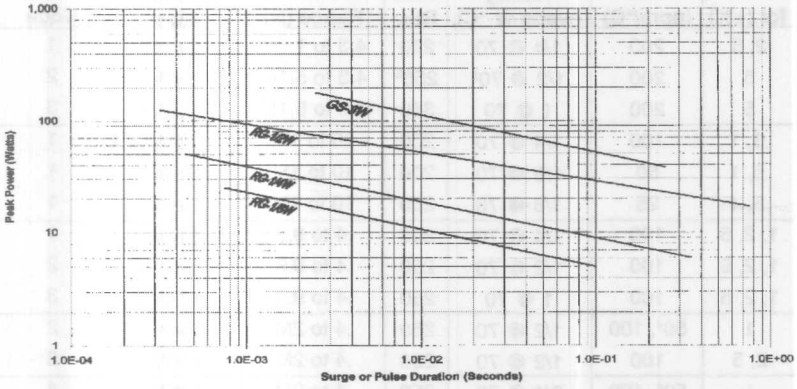
GS-3 SURFACE TEMP. RISE



COMMERCIAL POWER DERATING

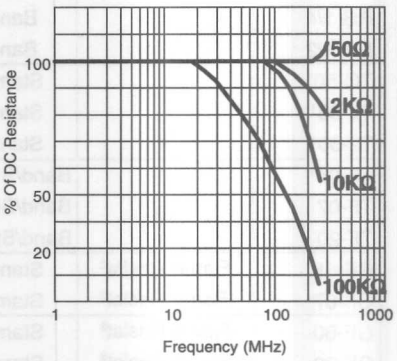


RG SERIES SURGE CAPABILITY for Repetitive Surges

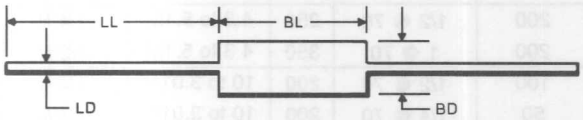


Note: Use for repetitive pulses where the average power dissipation is not to exceed the component rating at 70°C. Surge handling capacity for low-repetitive surges may be significantly greater than shown above. Contact factory for recommendations.

RG 1/4 HIGH-FREQUENCY CHARACTERISTICS



DIMENSIONS (Inches and (mm)):



Dim Code	Nominal Size	Body Length BL	Body Dia. BD	Lead Length LL	Lead Dia. LD	Clean Lead
1	1/8	0.150±0.020 (3.8±0.3)	0.066±0.008 (1.7±0.2)	1.00±0.125 (25.4±3.2)	0.016±0.002 (0.41±0.05)	0.225 (5.7)
2	1/4	0.250±0.015 (6.4±0.4)	0.090±0.008 (2.3±0.2)	1.50±0.125 (38.1±3.2)	0.025±0.002 (0.64±0.05)	0.310 (7.9)
3	1/2W	0.390±0.010 (9.9±0.3)	0.140±0.008 (3.6±0.2)	1.50±0.125 (38.1±3.2)	0.032±0.002 (0.81±0.05)	0.450 (11.4)
4	1/2W	0.390±0.010 (9.9±0.3)	0.140±0.008 (3.6±0.2)	1.50±0.125 (38.1±3.2)	0.025±0.002 (0.64±0.05)	0.450 (11.4)
5	3W	0.515±0.010 (13.1±0.3)	0.225±0.008 (5.7±0.2)	1.50±0.125 (38.1±3.2)	0.032±0.002 (0.81±0.05)	0.575 (14.6)

HOW TO ORDER:

Sample Part No.:

RG1/4 2203 (22K) 5%

IRC Type
See specification table for types available

Resistance
Standard EIA/MIL resistance values for metal film resistors. See specification table for range on inside back cover.

Tolerance
±0.1% to ±5%
See specification table for availability.

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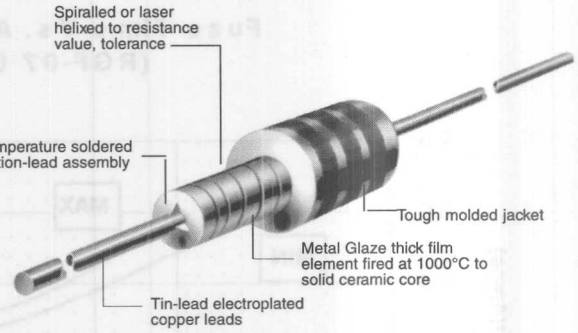
PRELIMINARY

ISO-9001 Registered

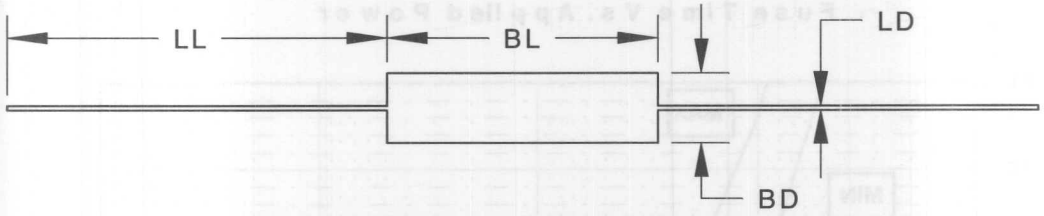
METAL GLAZE™ FUSING RESISTOR

RGF-07 SERIES



- Circuit fuse protection in a standard 1/4 watt axial leaded package
- Compatible with auto-insertion equipment
- Popular 0.2Ω samples immediately available
- Low inductance
- 150°C maximum operating temperature
- Flameproof
- Technology based on IRC's RG – over 35 years of production experience

DIMENSIONS (Inches and (mm)):



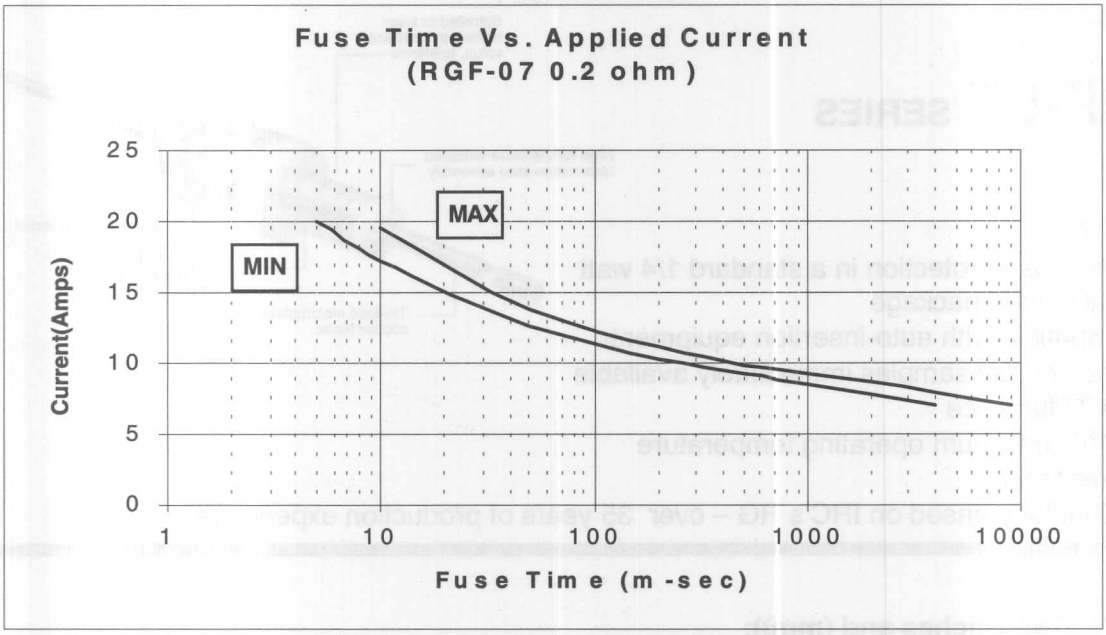
IRC Type	Body Length BL	Body Diameter BD	Lead Length LL[1]	Lead Diameter LD	Clean Lead
RGF-07	0.250±0.015 (6.4±0.4)	0.090±.0008 (2.3±0.2)	1.50±0.125 (38.1±3.2)	0.025±0.002 (0.64±0.05)	0.310 (7.9)

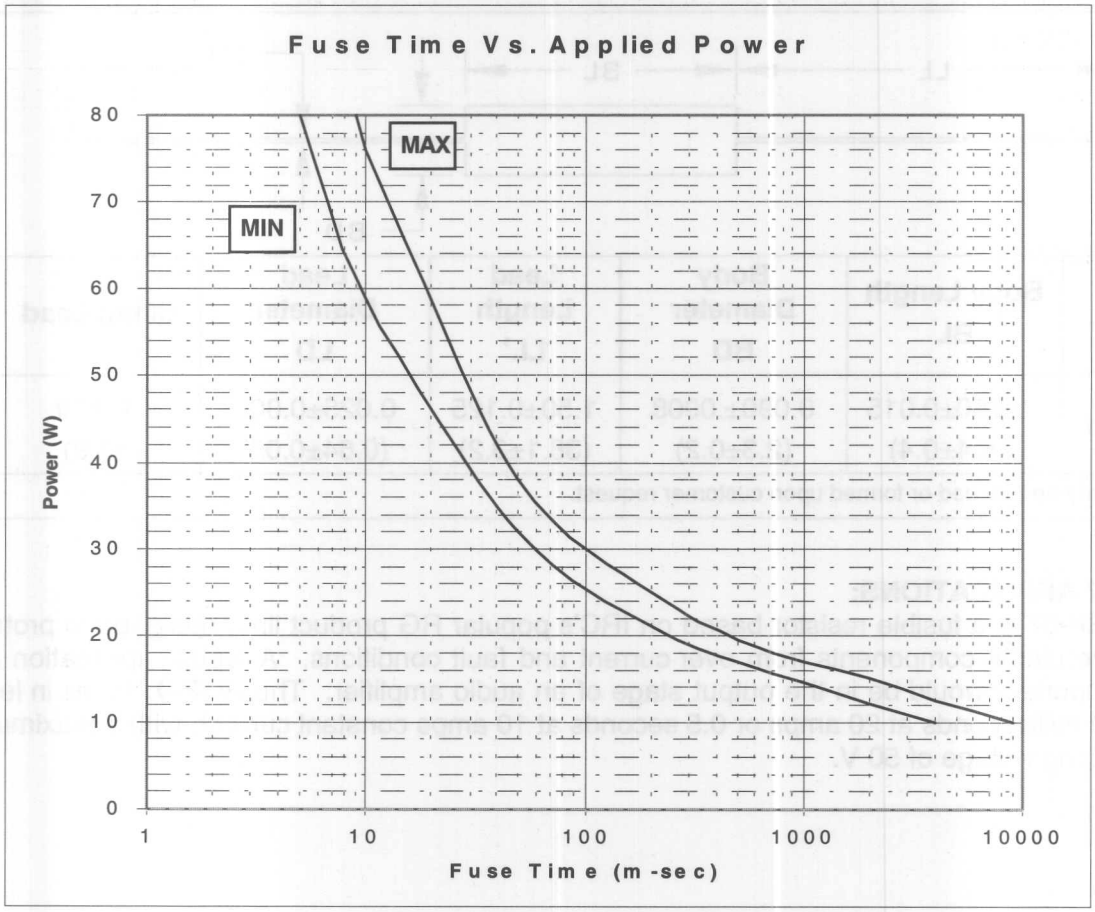
[1]Leads may be trimmed or formed upon customer request.

RGF-07 APPLICATIONS:

The RGF-07 is a fusible resistor based on IRC's popular RG product line, designed to protect sensitive circuit components from over current and fault conditions. A typical application for the component would be in the output stage of an audio amplifier. The RGF-07 fuses in less than 50 milliseconds at 20 amps or 0.5 seconds at 10 amps constant current, with a maximum interrupting voltage of 50 V.

FUSING CHARACTERISTICS





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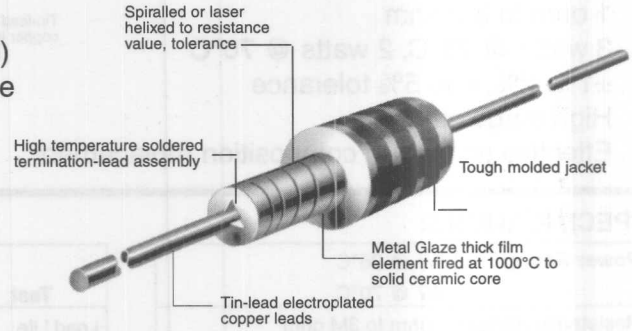
HIGH POWER METAL GLAZE™ RESISTOR

ISO-9001 Registered

ARG SERIES

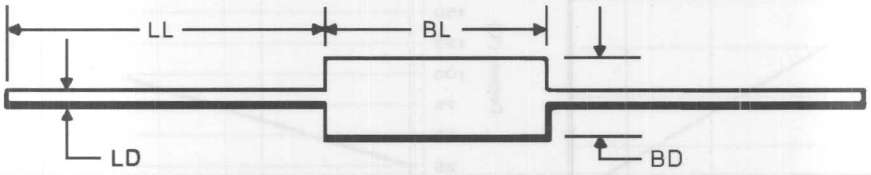


- 1 watt in 1/4 watt physical size (.250 x .090)
- TCR of ±100 ppm/°C with 2 or 5% tolerance
- Small size
- 30/70 electroplated copper leads
- Metal glaze thick film element
- Tough molded jacket
- Excellent power handling
- Unsurpassed heat transfer
- Solid ceramic substrates
- See GS/GF Series page 88, 89 for 2-3 watts
- High temperature soldered termination lead assembly
- Inherent capability to withstand heavy pulse overloads
- Performance equal to or exceeding MIL-R-10509 and MIL-R-22684

SPECIFICATIONS:

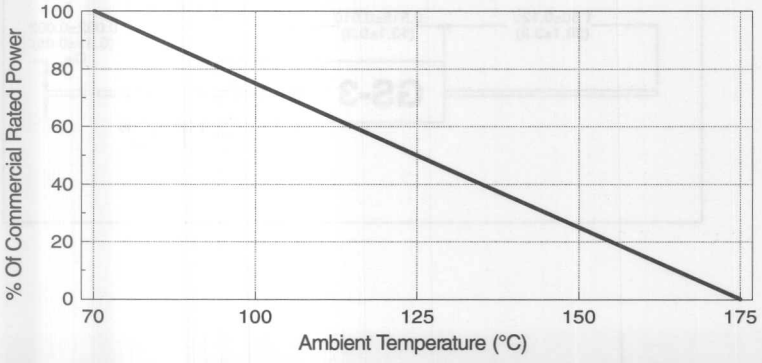
IRC Type	Power Rating	Resistance (ohms)	TC (ppm/°C)	Tolerance (%)	Max. Voltage
ARG07	1 watt @ 70°C	1 to 5.1M	100	2, 5	250

DIMENSIONS (Inches and (mm)):



IRC Type	Body Length BL	Body Diameter BD	Lead Length LL	Lead Diameter LD	Clean Lead
ARG07	0.250±0.015 (6.4±0.4)	0.090±0.008 (2.3±0.2)	1.50±0.125 (38.1±3.2)	0.025±0.002 (0.64±0.05)	0.310 (7.9)

POWER DERATING CURVE:

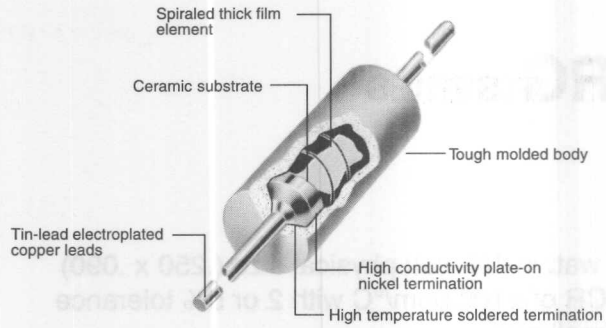


THICK FILM SEMI-PRECISION METAL GLAZE™ 2-3 WATT RESISTOR

ISO-9001 Registered

IRC

GS-3 SERIES



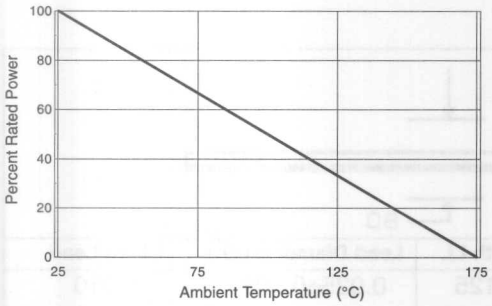
- 1 ohm to 3M ohm
- 3 watts @ 25°C, 2 watts @ 70°C
- ±1%, 2%, and 5% tolerance
- High surge strength
- Effective as carbon composition replacement

SPECIFICATIONS:

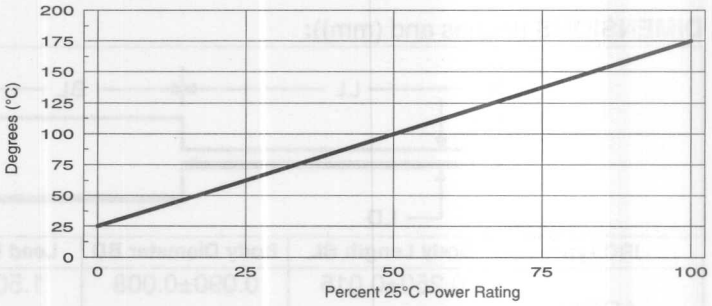
Power Rating	3W @ 25°C 2W @ 70°C
Resistance Range	1 ohm to 3M ohm
Tolerance	±1%, 2%, and 5%
Leads	Tin-lead electroplated copper
TCR	±50(T2) ppm/°C - (available on values greater than 10 ohms) ±100(T0) ppm/°C ±200 ppm/°C
Voltage Rating	1000V max.
Dielectric Strength	1000V min.
Identification	Printed style

Test		Maximum ΔR Limits			
		MIL-R-26	MIL-R-10509-D	MIL-R-22684	GS-3
Load Life	%ΔR	0.50	1.0	2.0	2.0
TCR ppm		30	100 (T0)	200	100/50
STOL	%ΔR	0.20	0.50	0.50	0.20
Moisture	%ΔR	0.20	1.50	1.5	0.40
Temp. Cycle	%ΔR	0.20	0.50	-	0.20
Solder Effect	%ΔR	-	0.50	0.50	0.20
Term. Strength	%ΔR	0.10	0.20	0.50	0.10
Shock	%ΔR	0.10	0.50	0.50	0.10
Vibration	%ΔR	0.10	0.50	0.50	0.10

DERATING CHART:



HOT SPOT TEMPERATURE +25°C AMBIENT



HOW TO ORDER:

Sample Part No.: **GS-3 T0 1002 F**

MIL Style
GS=Fixed Film Resistor. High Stability

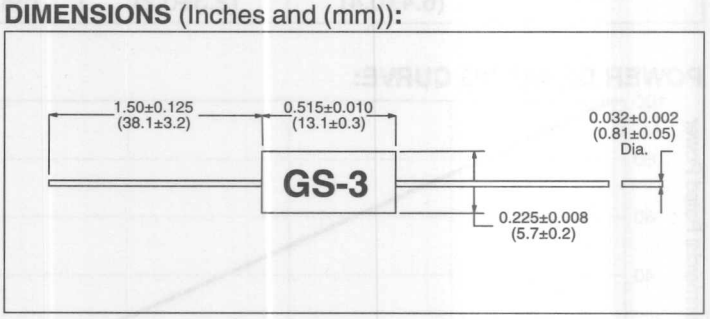
Power Rating
3=3 watt

T.C. Characteristics
T0=±100 ppm/°C
T2=±50 ppm/°C- (available on values greater than 10 ohms)

Resistance
First three digits represent significant figures; fourth digit is number of zeros.

Tolerance
F=±1%, G=±2%, J=±5%

DIMENSIONS (Inches and (mm)):



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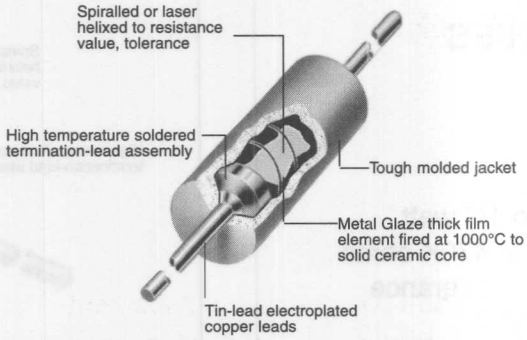
THICK FILM METAL GLAZE™ RESISTOR

ISO-9001 Registered

GF SERIES



- Flame resistant construction
- Rugged molded jacket
- High temperature soldered termination
- Metal Glaze™ thick film element

SPECIFICATIONS:

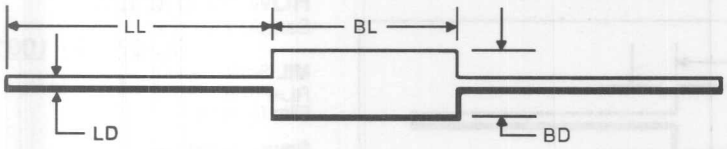
IRC Type	Flamability	Marking	Tolerance (±%)	T.C. (ppm/°C)	IRC Power Rating (watts @ °C)
GF-55	Flame Resist[1]	Stamp	1	50*, 100	1/2W @ 70°C
GF-07	Flame Resist[1]	Stamp	2, 5	100	1/2W @ 70°C
GF-60	Flame Resist[1]	Stamp	1	50*, 100	3/4W @ 70°C
GF-20	Flame Resist[1]	Stamp	2, 5	100	3/4W @ 70°C
GF-3	Flame Resist[1]	Stamp	1, 2, 5	200	2W @ 70°C 3W @ 25°C

* T.C. of 50 ppm/°C on values of 10 ohms or greater.

IRC Type	Maximum Voltage Rating	IRC Resistance Range (ohms)	MIL Resistance Range (ohms)	Nominal Size	Dimension Code
GF-55	250	0.4 to 2M	-	1/4W	3
GF-07	250	0.4 to 2M	-	1/4W	3
GF-60	350	0.4 to 2M	-	1/2W	4
GF-20	350	0.4 to 2M	-	1/2W	4
GF-3	750	1 to 2M	-	3W	5

NOTE: [1]Contact factory for details of flame-resistant specifications.

DIMENSIONS (Inches and (mm)):



Dim Code	Nominal Size	Body Length BL	Body Diameter BD	Lead Length LL	Lead Diameter LD	Clean Lead
3	1/4	0.250±0.015 (6.4±0.4)	0.090±0.008 (2.3±0.2)	1.50±0.125 (38.1±3.2)	0.025±0.002 (0.64±0.05)	0.310 (7.9)
4	1/2W	0.390±0.010 (9.9±0.3)	0.140±0.008 (3.8±0.2)	1.50±0.125 (38.1±3.2)	0.025±0.002 (0.64±0.05)	0.450 (11.4)
5	3W	0.515±0.010 (13.1±0.3)	0.225±0.008 (5.7±0.2)	1.50±0.125 (38.1±3.2)	0.032±0.002 (0.81±0.05)	0.575 (14.6)

HOW TO ORDER:

Sample Part No.:

GF-20 D 1002 F

MIL Style
GS=Fixed film resistor. High stability

Power Rating
07=1/2 watt
20=3/4 watt
3=3 watt

T.C. Characteristics
D=±100 ppm/°C
C=±50 ppm/°C

Resistance
First three digits represent significant figures; fourth digit is number of zeros.

Tolerance
F=±1%, G=±2%, J=±5%

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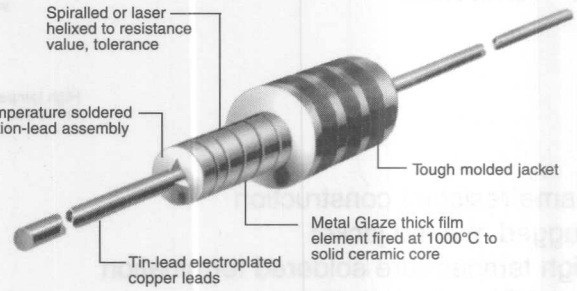
SEMI-PRECISION MIL-QUALIFIED METAL GLAZE™ RESISTOR

ISO-9001 Registered

IRC

RL SERIES



- 1/4 watt to 1/2 watt
- 4.3 ohms to 470K ohms
- 2% and 5% tolerance
- ±200 ppm/°C
- MIL-R-22684

SPECIFICATIONS:

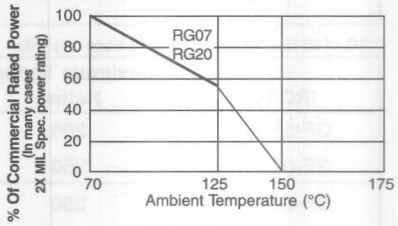
MIL Type	Marking	Tolerance (±%)	T.C. (ppm/°C)	MIL Power Rating (watts)	MIL Resistance Range (ohms)*	Nominal Size	Max Voltage Rating
RL07	Band	2, 5	200	1/4 @ 70°C	51 to 150K	1/4W	250
RL20	Band	2, 5	200	1/2 @ 70°C	4.3 to 470K	1/2W	350

* For values below or above Mil Resistance, the **Non-Mil** part can be used. But keep in mind -- it is a non-mil part.

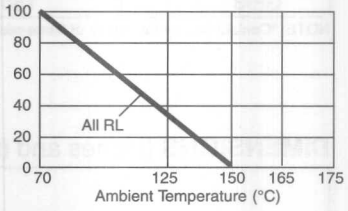
RL07 PERFORMANCE:

Test Conditions	MIL-R-22684 Test Limits Allowed	RL07 Max. %ΔR(±3σ)
Temperature Coefficient ppm/°C	±200	±200
Low Temperature Operation	±0.50%	±0.10%
Thermal Shock	±1.00%	±0.15%
Moisture Resistance	±1.5%	±0.05%
Short Time Overload	±0.50%	±0.10%
Load Life (70°C---1/4W) 1000 hrs.	±2.00%	±0.40%
Terminal Strength	±0.50%	±0.10%
Effect of Soldering	±0.50%	±0.10%
Shock	±0.50%	±0.05%
Vibration	±0.50%	±0.05%
High Temperature Exposure (150°C No Load)	N/A	±0.75%
Rated Power for 10,000 hrs. at 70°C	N/A	±0.60%
Temperature Rise at 1/4W Power Load	-	See Temp. Rise Chart
Dielectric Strength	±0.50%	±0.05%

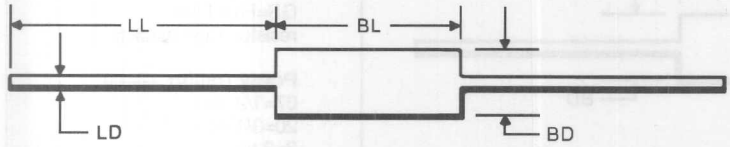
COMMERCIAL POWER DERATING:



MIL SPEC POWER DERATING:



DIMENSIONS (Inches and (mm)):



Nominal Size	Body Length BL	Body Diameter BD	Lead Length LL	Lead Diameter LD	Clean Lead
1/4 watt	0.250±0.015 (6.4±0.4)	0.090±0.008 (2.3±0.2)	1.50±0.125 (38.1±3.2)	0.025±0.002 (0.64±0.05)	0.310 (7.9)
1/2 watt	0.390±0.010 (9.9±0.3)	0.140±0.008 (3.6±0.2)	1.50±0.125 (38.1±3.2)	0.032±0.002 (0.81±0.05)	0.450 (11.4)

HOW TO ORDER:

Sample Part No.:

RL-07 - S - 1001 - G

MIL Style
RL=Fixed Film Resistor

Power Rating
07=1/4 watt
20=1/2 watt

Lead Material
S=Solderable/weldable leads

Resistance
First three digits represent significant figures; fourth digit is number of zeros.

Tolerance
G=2%, J=5%

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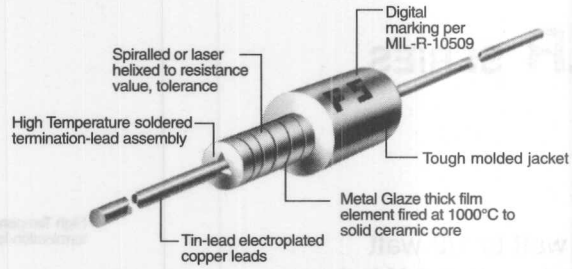
PRECISION MIL-QUALIFIED METAL GLAZE™ RESISTOR

ISO-9001 Registered

IRC

RN SERIES



- 1/8 watt to 1/2 watt
- 10 ohms to 1M ohms
- 0.1% to 1% tolerance
- MIL-R-10509 ±25 ppm/°C to ±100

SPECIFICATIONS:

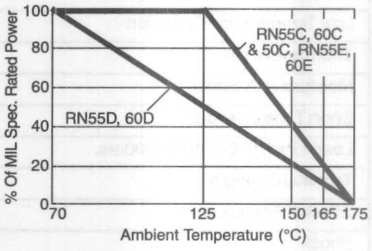
MIL Type	Marking	Tolerance (±%)	T.C. (ppm/°C)	MIL Power Rating (watts)	MIL Resistance Range (ohms)	Nominal Size	Max Voltage Rating
RN50C*	Stamp	1	50	1/20 @ 125°C	10 to 100K	1/8W	200
RN55D	Stamp	1	100	1/8 @ 70°C	10 to 301K	1/4W	200
RN55C	Stamp	0.1, 0.5, 1	50	1/10 @ 125°C	49.9 to 100K	1/4W	200
RN55E	Stamp	0.1, 0.5, 1	25	1/10 @ 125°C	49.9 to 100K	1/4W	200
RN60D	Stamp	1	100	1/4 @ 70°C	10 to 1M	1/2W	300
RN60C	Stamp	0.1, 0.5, 1	50	1/8 @ 125°C	49.9 to 499K	1/2W	250
RN60E	Stamp	0.1, 0.5, 1	25	1/8 @ 125°C	49.9 to 499K	1/2W	250

Note: *Conformal coating construction on 1/8 nominal size resistors.

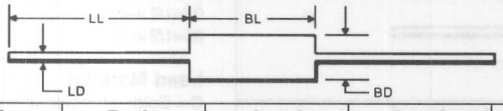
RN55 PERFORMANCE:

Test Conditions	MIL-R-10509 Test Limits Allowed		RN55 Max. %ΔR(±3σ)	
	RN55 (D)	RN55 (C)	T0-55	T2-55
Temperature Coefficient ppm/°C	+200/-500	±50	±100	±50
Low Temperature Operation	±0.50%	±0.25%	±0.10%	±0.10%
Temperature Cycling	±0.50%	±0.25%	±0.10%	±0.10%
Moisture Resistance	±1.50%	±0.50%	±0.50%	±0.50%
Short Time Overload	±0.50%	±0.25%	±0.10%	±0.10%
Load Life (70°C-1/2W, 125°C-1/100W) 1000 hrs.	±1.00%	±0.50%	±0.30%	±0.20%
Terminal Strength	±0.20%	±0.20%	±0.05%	±0.05%
Effect of Soldering	±0.50%	±0.10%	±0.10%	±0.10%
Shock	±0.50%	±0.25%	±0.05%	±0.05%
Vibration	±0.50%	±0.25%	±0.05%	±0.05%
High Temperature Exposure (150°C No Load)	N/A	N/A	±0.50%	±0.50%
2X Rated Power for 10,000 hrs. at 70°C	N/A	N/A	±0.50%	±0.50%
Temperature Rise at 1/4W Power Load	-	-	See Temp. Rise Chart	
Dielectric Strength	±0.50%	±0.25%	±0.05%	±0.05%

MIL SPEC POWER DERATING:



DIMENSIONS (Inches and (mm)):



Nominal Size	Body Length BL	Body Diameter BD	Lead Length LL	Lead Diameter LD	Clean Lead
1/8 watt	0.150±0.020 (3.8±0.5)	0.066±0.008 (1.7±0.2)	1.00±0.125 (25.4±3.2)	0.016±0.002 (0.41±0.05)	0.225 (5.7)
1/4 watt	0.250±.015 (6.4±.4)	0.090±.008 (2.3±.2)	1.50±.125 (38.1±3.2)	0.025±.002 (0.64±0.05)	0.310 (7.9)
1/2 watt	0.390±.010 (9.9±.3)	0.140±.008 (3.6±.2)	1.50±.125 (38.1±3.2)	0.025±.002 (0.64±0.05)	0.450 (11.4)

HOW TO ORDER:

Sample Part No.:

RN - 55 - D - 1002 - F

MIL Style
RL=Fixed film resistor
High stability

Power Rating
50=1/20 watt
55=1/10 watt
60=1/8 watt

T.C. Characteristics
D=±100 ppm/°C
C=±50 ppm/°C
E=±25 ppm/°C

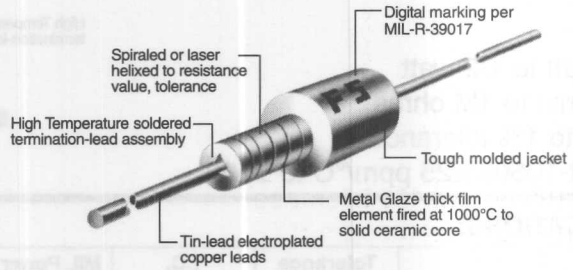
Resistance
First three digits represent significant figures; fourth digit is number of zeros.

Tolerance
F=±1%, D=±0.5%, B=±0.1%

ESTABLISHED RELIABILITY MIL-QUALIFIED METAL GLAZE™ RESISTOR

ISO-9001 Registered

RLR SERIES



- 1/8 watt to 1/2 watt
- 4.3 ohms to 3.01M ohms
- 1% and 2% tolerance
- TCR of ±100 ppm/°C
- MIL-R-39017 approved to "S" level

SPECIFICATIONS:

MIL Type	Marking	Tolerance (±%)	TCR (ppm/°C)	MIL Power Rating (watts)	MIL Resistance Range (ohms)	Nominal Size	Max Voltage Rating
RLR05/S*	Stamp	1, 2	100	1/8 @ 70°C	10 to 301K	1/8W	200
RLR07/S	Stamp	1, 2	100	1/4 @ 70°C	10 to 3.01M	1/4W	250
RLR20/S	Stamp	1, 2	100	1/2 @ 70°C	4.3 to 3.01M	1/2W	350

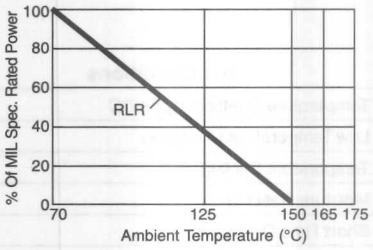
*Conformally coated construction on all 1/8 nominal sizes.

RLR-07 PERFORMANCE:

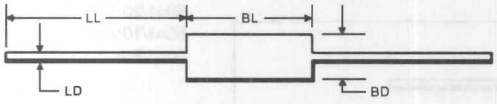
Test Conditions	MIL-R-39017 Test Limits Allowed	RLR-07 Max. %ΔR(±3σ)
Temperature Coefficient ppm/°C	±100	±100
Low Temperature Operation	±0.25%	±0.05%
Thermal Shock	±0.25%	±0.15%
Moisture Resistance	±1.00%	±0.50%
Short Time Overload	±0.50%	±0.15%
Load Life (70°C-1/4W) 1000hrs.	±4.00%	±0.50%
Terminal Strength	±0.25%	±0.05%
Effect of Soldering	±0.25%	±0.10%
Shock	±0.50%	±0.05%
Vibration	±0.50%	±0.05%
High Temperature Exposure (150°C No Load)	±2.00%	±0.50%
Temperature Rise at 1/4W Power Load	-	See Temp. Rise Chart
Dielectric Strength	±0.25%	±0.05%

ESTABLISHED RELIABILITY MIL SPECIFICATIONS: RLR products listed above are qualified to the appropriate established reliability MIL Specification. In general, Metal Glaze units such as these are specified for all RLR requirements.

MIL SPEC POWER DERATING:



DIMENSIONS (Inches and (mm)):



Nominal Size	Body Length BL	Body Diameter BD	Lead Length LL	Lead Diameter LD	Clean Lead
1/8 watt	0.150±0.020 (3.8±0.5)	0.066±0.008 (1.7±0.2)	1.00±0.125 (25.4±3.2)	0.016±0.002 (0.41±0.05)	0.187 (4.7)
1/4 watt	0.250±.015 (6.4±.4)	0.090±.008 (2.3±.2)	1.50±.125 (38.1±3.2)	0.025±.002 (0.64±0.05)	0.300 (7.6)
1/2 watt	0.390±.010 (9.9±.3)	0.140±.008 (3.6±.2)	1.50±.125 (38.1±3.2)	0.032±.002 (0.81±0.05)	0.450 (11.4)

HOW TO ORDER:

Sample Part No.:

RLR-20 C 1001 F S

MIL Style
RLR=Fixed film resistor. Established reliability.

Power Rating
05=1/8 watt
07=1/4 watt
20=1/2 watt

Lead Material
C = Solderable/weldable leads

Resistance
First three digits represent significant figures; fourth digit is number of zeros.

Tolerance
F=±1%, G=±2%

Failure Rate
S = 0.001% for 1000 hrs. (60% confidence)

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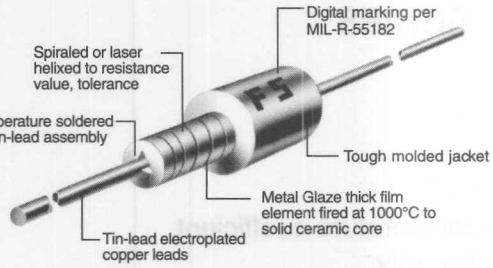
ESTABLISHED RELIABILITY MIL-QUALIFIED METAL GLAZE™ RESISTOR

ISO-9001 Registered

RNC SERIES



- 1/20 watt to 1/8 watt
- 10 ohms to 2M ohms
- 0.1%, 0.5%, and 1% tolerance
- ±25 ppm/°C to ±100 ppm/°C
- MIL-R-55182 approved to S level

SPECIFICATIONS:

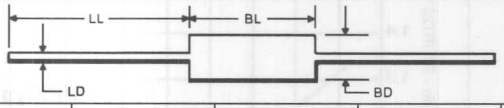
MIL Type	Marking	Tolerance (±%)	T.C. (ppm/°C)	MIL Power Rating (watts)	MIL Resistance Range (ohms)	Nominal Size	Voltage Rating
RNC50H/S[1]	Stamp	1	50	1/20 @ 125°C	10 to 301K	1/8W	200
RNC50J/S[1]	Stamp	1	25	1/20 @ 125°C	10 to 301K	1/8W	200
RNC50K/S[1]	Stamp	1	100	1/20 @ 125°C	10 to 301K	1/8W	200
RNC55H/S	Stamp	0.1, 0.5, 1[2]	50	1/10 @ 125°C	10 to 2M[2]	1/4W	200
RNC55K/S	Stamp	0.5, 1[2]	100	1/10 @ 125°C	10 to 2M[2]	1/4W	200
RNC55J/S	Stamp	0.1, 0.5, 1[2]	25	1/10 @ 125°C	10 to 2M[2]	1/4W	200
RNC60H/S	Stamp	0.1, 0.5, 1	50	1/8 @ 125°C	10 to 100K	1/2W	250
RNC60K/S	Stamp	0.5, 1	100	1/8 @ 125°C	10 to 100K	1/2W	250
RNC60J/S	Stamp	0.1, 0.5, 1	25	1/8 @ 125°C	10 to 100K	1/2W	250

NOTE: 1- Conformally coated construction on all 1/8W nominal sizes. 2- Only available in F tolerance above 1M ohm.

Environmental Conditions	Maximum Change Per MIL-R-55182	Typical IRC Performance
Thermal Shock	±0.20%	±0.02%
Overload	±0.20%	±0.05%
Low Temperature Operation	±0.15%	±0.03%
Terminal Strength	±0.20%	±0.02%
Dielectric Withstanding Voltage	±0.15%	±0.05%
Resistance to Soldering Heat	±0.10%	±0.02%
Moisture Resistance	±0.40%	±0.15%
Shock, Medium Impact	±0.20%	±0.05%
Vibration, High Frequency	±0.20%	±0.02%
2.000 - Hour Life	±0.50%	±0.10%
10,000 - Hour Life	±2.00%	±0.30%
High Temperature Exposure	±0.50%	±0.10%

ESTABLISHED RELIABILITY MIL SPECIFICATIONS: RNC products listed above are qualified to the appropriate established reliability MIL Specification. In general, Metal Glaze™ units such as these are specified for all RNC requirements.

DIMENSIONS (Inches and (mm)):



Nominal Size	Body Length BL	Body Diameter BD	Lead Length LL	Lead Diameter LD	Clean Lead
1/8 watt	0.150±0.020 (3.8±0.5)	0.066±0.008 (1.7±0.2)	1.00±0.125 (25.4±3.2)	0.016±0.002 (0.41±0.05)	0.187 (4.7)
1/4 watt	0.250±.015 (6.4±.4)	0.090±.008 (2.3±.2)	1.50±.125 (38.1±3.2)	0.025±.002 (0.64±0.05)	0.300 (7.6)
1/2 watt	0.390±.010 (9.9±.3)	0.140±.008 (3.6±.2)	1.50±.125 (38.1±3.2)	0.025±.002 (0.64±0.05)	0.450 (11.4)

HOW TO ORDER:

Sample Part No.:

RNC-55 H 7500 F S

MIL Style
RNC = Solderable/ weldable leads

Power Rating
50= 1/20 watt
55= 1/10 watt
60= 1/8 watt

T.C. Characteristics
K= ±100 ppm/°C
H= ±50 ppm/°C
J= ±25 ppm/°C

Resistance
First three digits represent significant figures; fourth digit is number of zeros.

Tolerance
F=±1%, D= ±0.5%, B= ±0.1%

Failure Rate
S = 0.001% for 1000 hrs. (60% confidence)

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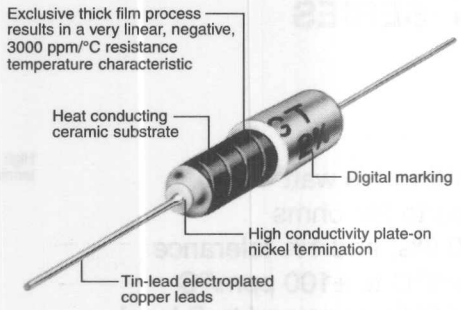
THICK FILM TEMPERATURE COMPENSATION RESISTOR

ISO-9001 Registered

IRC

RGT SERIES



- Negative temperature coefficient
- Superior linearity
- Stable thick-film technology
- Effective compensation for positive TC devices, semiconductors and copper

SPECIFICATIONS:

Temperature Coefficient	Resistance Ratio	Linearity	Standard Resistance Values @ 25°C (ohms)	Std. Resistance Tol. @ 25°C
-0.30%/°C (minus 3000 ppm/°C @ 25°C)	R25°C/R125°C= 1.37	<1.2% deviation per 100°C (typical over range from -55°C to 140°C)	740, 1K and 10K. Others available	±2%, ±5%, ±10%

Operating Temperature Range	High Temp. Stability	Time Constraints	Dissipation Constants	Element
-55°C to +175°C	2000 hours at 175°C, <0.5%ΔR	7.4 sec for RGT-1, 2.9 sec. for RGT-2 (time to achieve 63.2% of an applied step-change in temperature in still air)	8.1mW/°C for RGT-1, 4.7mW°C for RGT-2 (power required to raise sensor temperature 1°C in a still air ambient of 25°C)	fused thick-film composition

Substrate	Lead Pull	Resistance to Soldering Heat	Marking Resistance to Solvents	Lead Solderability
solid-core alumina ceramic	5 lbs for 5 sec.	MIL-STD-202E, Method 210A, cond. A, <0.5%ΔR	MIL-STD-202, Method 215	MIL-STD-202, Method 208

APPLICATIONS:

Compensates transistors, diodes, sensors, transducers, hall devices, microprocessors, strain gauges. Proven in automotive under-hood use.

CURVE TOLERANCES (±):

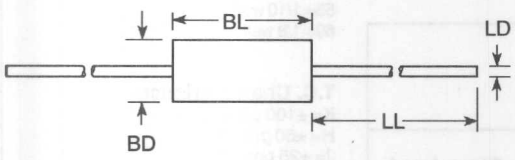
Temperature		G Tol.	J Tol.	K Tol.
-55°C	-67°F	7%	10%	15%
-15°C	+9°F	4.5%	7.5%	12.5%
0°C	+32°F	3.6%	6.6%	11.6%
25°C	77°F	±2%	±5%	±10%
50°C	122°F	2.5%	5.5%	10.5%
75°C	167°F	3.0%	6.0%	11.0%
100°C	212°F	3.5%	6.5%	11.5%
125°C	257°F	4.0%	7.0%	12.0%
150°C	302°F	4.5%	7.5%	12.5%
175°C	347°F	5.0%	8.0%	13.0%

RESISTANCE vs TEMPERATURE:

°C	°F	R in Ωs*	°C	°F	R in Ωs*	°C	°F	R in Ωs*
-60	-76	1285.2	+40	+104	956.7	+125	+257	734.0
-40	-40	1208.5	+50	+122	928.2	+130	+266	723.2
-30	-22	1173.4	+60	+140	900.2	+140	+284	703.7
-20	-4	1139.3	+70	+158	872.3	+150	+302	685.8
-10	+14	1106.3	+75	+167	858.7	+160	+320	669.3
0	+32	1074.6	+80	+176	845.2	+170	+338	653.8
+10	+50	1044.1	+90	+194	818.8	+180	+356	639.7
+20	+68	1014.6	+100	+212	793.2	+230	+446	582.9
+25	+77	1000.0	+110	+230	768.5			
+30	+86	985.5	+120	+248	745.1			

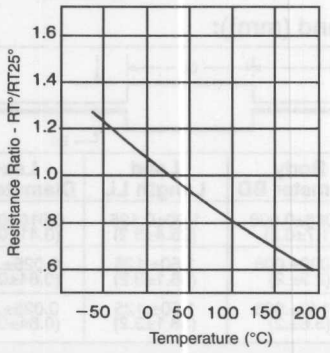
*Based on actual measurements of resistors that were 1000 ohms at 25°C

DIMENSIONS (Inches and (mm)):



IRC Type	Body Length (BL)	Body Diameter (BD)	Lead Diameter (LD)	Lead Length (LL)
RGT-2	0.150 (3.81)	0.066 (1.70)	0.016 (0.41)	1.0 (25.4)
RGT-1	0.250 (6.35)	0.090 (2.29)	0.025 (0.64)	1.5 (38.1)

LINEARITY:



HOW TO ORDER:

Sample Part No.:

RGT-2 103 G

IRC Type

Size
See 2 sizes available at left

Resistance Value
2 digit range and 1 digit multiplier

Tolerance
G = 2%, J = 5%, K = 10%

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FLAMEPROOF POWER METAL FILM RESISTORS

ISO-9001 Registered

MFP SERIES

- Small size for power rating
- Flameproof protection

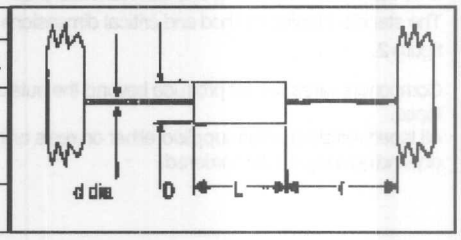
ELECTRICAL DATA:

	MFP05	MFP1	MFP2
Power rating at 70°C watts	0.5	<1 ohm: 0.7>1 ohm:1.0	2
Resistance range watts	7R5 - 15R0	0.1 - 1M	1R0 - 1M
Limiting element voltage volts	350		
TCR ppm/°C	100	<1 ohm:300 1 ohm-9.1 ohm: 200 >10 ohm:100	100
Resistance Tolerance * %	1, 2, 5		
Standard Values	E24 preferred		
Thermal Impedance °C/watt	150	120	82
Ambient Temperature °C	-55 to 155		

*** Below 1 ohm 5% TOL preferred.**

PHYSICAL DATA:

Dimensions (mm) and Weight (g)							
Type	L max.	D max.	f min.	d nom.	PCB mounting centers	Min. bend radius	Wt. nom.
MFP05	3.5	1.8	22.4	0.5	7.6	0.5	0.1
MFP1	6.2	2.3	21.0	0.6	10.2	0.6	0.3
MFP2	10.0	4.0	19.0	0.8	18.4	1.2	0.55



Construction:

The resistance element is a precisely controlled thin film of metal alloy on a high purity ceramic core, protected by a cement coating applied so that terminations remain completely clear. Thsi permits a well-defined body length (clean lead to clean lead dimension "L".

Terminations:

Material: Solder coated copper wire

Strength: The terminations meet the requirements of IEC 68.2.21.

Solderability: The terminations meet the requirements of IEC 115.1 Clause 4.17.3.2.

Marking: Resistors are color coded with 4 or 5 bands depending on value and tolerance. IEC colors are used.

Solvent Resistance: The body protection and marking are resistant t oall normal industrial cleaning solvents suitable for printed circuits.

Flammability: The resistor coating will not burn or emit incandescent particles under any condition of applied temperature or power overload.

ISO-9001 Registered

IRC

PERFORMANCE DATA

		MAXIMUM
Load at rated power: 1000 hours at °C	ΔR%	5
Shelf life: 12 months at room temperature	ΔR%	2
Derating from derated power at 70°C	ΔR%	Zero at 155°C
Climati	ΔR%	3
Climatic category		50/155/56
Temperature rapid change	ΔR%	0.5
Resistance to solder heat	ΔR%	0.5
Voltage proof	volts	500 min

APPLICATION NOTES

1. If the resistors are to dissipate full rated power, it is recommended that the terminations should not be soldered closer than 4mm from the body.

2. Due to operating temperature limitations imposed by some pcb materials, derating may be necessary. An estimate of t temperature rise to be expected can be calculated using t thermal impedance figures given under Electrical Data.

PACKAGING

MFP resistors are normally supplied tape packed ready for loading onto automatic sequencing and insertion machines
The standard taping method and critical dimensions are shown in figure 2.

Component wires will not protrude beyond the outside edge of the tapes.
All taped resistors will be supplied either on reels or in ammopacks, depending on quantities ordered.

STANDARD QUANTITIES PER PACKAGE

Type	Code	MFP05	MFP1	MFP2
Reel	R	5000	5000	2500
Ammopack A	A	5000	5000	2500

ORDERING PROCEDURE

Specify type references etc. as indicated in this example of MFP 05 15 ohms 5% resistors, taped and reeled.

MFP05 15R J R

Type

Value (use IEC 62 code)

Tolerance (use IEC 62 code)

G	2%
J	5%

Packaging detail

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PLANAR POWER RESISTOR

ISO-9001 Registered

IRC

PPR SERIES

- 250 watts power dissipation at 100°C
- 1000 watts overload for 10 secs at 70°C
- High power to size ratio
- Low inductance design
- Easily mounted to heat sink

ELECTRICAL DATA:

		PPR250	PPR250H	NOTES
Power rating at 100°C	watts	250		Temperatures refer to external heatsink (see Application Notes)
Overload rating for 10 sec at 70°C	watts	1000		
Resistance range	ohms	0.25 to 1M		
Limiting element voltage	volts	5K	5K	
Isolation	volts	7K	14K	
TCR (20° to 70°C)	ppm/°C	0.25 to 1 ohm: 250, 1 to <100 ohm: 150, >100 ohm: 100		
Resistance tolerance	%	<1 ohm:10%, >1 ohm: 1, 2, 5, 10%		Standard tolerance 10%
Standard values		E24 preferred		Any value to order
Ambient temperature range	°C	-55 to 125		

CONSTRUCTION:

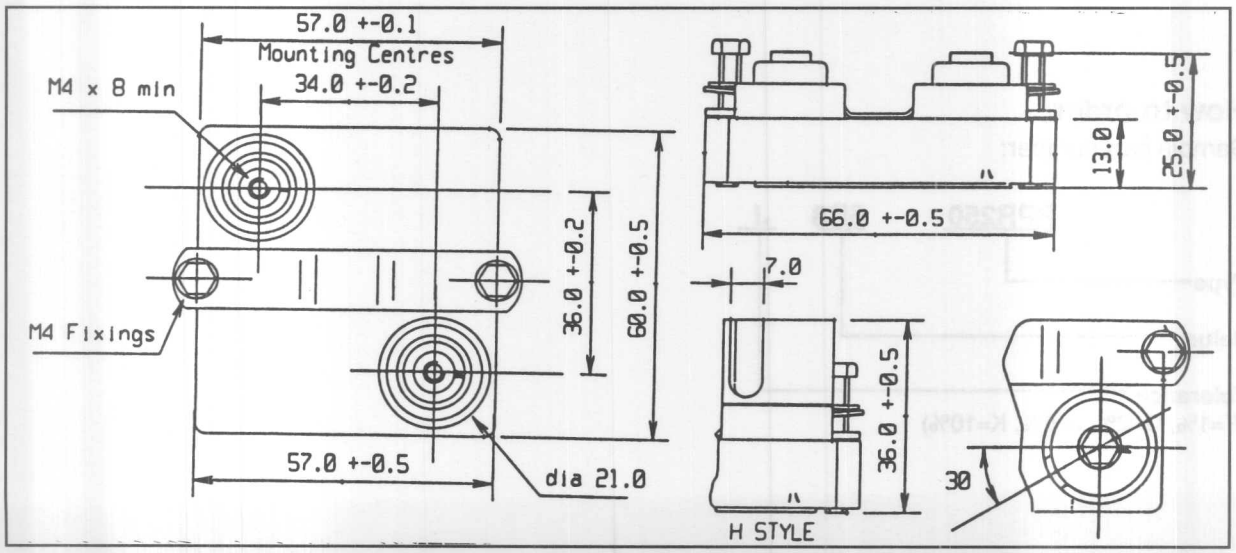
The resistive element is printed onto a high quality ceramic substrate with a specially selected thick film resistor ink based on a ruthenium oxide/glass system. An internal ceramic heat sink and terminals are fitted prior to encapsulating the assembly inside a mounded case with a flexible potting material of high thermal conductivity.

The PPR250H has in addition, a molded terminal shroud fitted to the case to increase isolation voltage.

TERMINATIONS: Brass

MARKING: Legend marked with type reference, resistance value and tolerance and date code.

SOLVENT RESISTANCE: Case and marking are resistant to all normal cleaning solvents suitable for printed circuits.



PERFORMANCE

ISO-9001 Registered

		Maximum	Typical
Load at rated power: 1000 hours at 100°C heat sink temperature	ΔR%	2 + 0.05 ohm	0.2
Shelf life: 12 months at room temperature	ΔR%	0.2 + 0.05 ohm	0.05
Derating from rated power at 100°C		Zero at 125°C	
Short term overload at 70°C heat sink temperature	ΔR%	2 + 0.05 ohm	0.2
Climatic	ΔR%	2 + 0.05 ohm	0.2
Climatic category		55/125/56	
Long term damp heat	ΔR%	1 + 0.05 ohm	0.2
Temperature rapid change	ΔR%	2 + 0.05 ohm	0.2
Bump (40G/4000)	ΔR%	0.5 + 0.05 ohm	0.25
Vibration	ΔR%	0.5 + 0.05 ohm	0.25
Robustness (200Ncm/200N)	ΔR%	1 + 0.05 ohm	0.1
Partial discharge (5000v rms)	pC	<10	
Mass capacitance	pF	120	
Parallel capacitance	pF	40	
Shelf inductance	nH	<40	
Insulation resistance	ohms	10^5M (min)	

APPLICATION NOTES:

Heat Sink Selection

It is important to select a heat sink with a thermal resistance of ≤0.12°C/W to enable the component to operate at its full rated power of 250W with a 100°C heat sink temperature. Forced air or internal liquid cooling is required to maintain specified temperature limits.

Mounting

A thermal grease (i.e., Dow Corning DC340 or equivalent with Thermal Conductivity of 0.42w/mk) is to be applied between the heatsink and the component which is to be mounted using a special compression bar, 16mm M4 screws and washers. The mounting torque to be within the range of 120 to 150N. This will optimise the heat transfer and power dissipation of the device and allow for temperature and expansion changes.

The mounting area on the heatsink must have a surface finish of ≤0.05mm. the maximum temperature gradient permitted on the heatsink/component contact area is ≤20°C.

Packaging

As standard all components are supplied loose packed in boxes.

Quantities per Box

Standard quantity 2 per box.

How to order:

Sample part number:

PPR250 6R8 J

Type

Value

Tolerance

(F=1%, G=2%, J=5%, K=10%)

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FAST FUSIBLE METAL FILM RESISTORS

ISO-9001 Registered

WFF SERIES

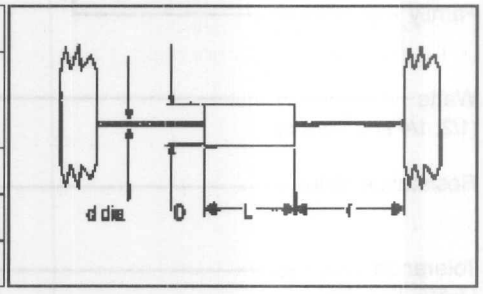
- Value to 2.2 Meg
- High stability metal film
- High working voltage to 3.5kV

ELECTRICAL DATA:

		WFF1/4	WFF1/2	WFF1
Power rating at 70°C	watts	0.25	0.5	1
Resistance range	ohms	0.1 - 10K	0.1 - 27K	0.2 - 1K5
Limiting element voltage	volts	250	350	350
TCR	ppm/°C	250		
Resistance tolerance	%	5		
Standard values		E24 preferred		
Thermal impedance	°C/watt	150	120	100
Operating temperature range	°C	-55 to 155		

PHYSICAL DATA:

Dimensions (mm) and Weight (g)							
Type	L max	D max	f min	d nom	PCB mounting centers	Min. bend radius	Wt. nom
WFF1/4	6.2	2.3	21.0	0.6	10.2	0.6	0.3
WFF1/2	9.0	3.4	19.6	0.8	12.7	1.2	0.6
WFF1	12.5	4.2	17.8	0.8	18.4	1.2	0.9



PERFORMANCE DATA:

		Maximum
Load: 1000 hrs at 70°C	ΔR%	3 ± 0.05Ω
Shelf life: 12 months at room temperature	ΔR%	2 ± 0.05Ω
Derating from rated power at 70°C		zero at 155°C
Temperature rapid change	ΔR%	0.5 ± 0.05Ω
Resistance to solder heat	ΔR%	0.5 ± 0.05Ω

ISO-9001 Registered

IRC

CONSTRUCTION

The metal film is deposited on a high purity ceramic rod. End caps are force fitted and termination wires welded to the caps. The resistive film is adjusted to the required value by a helical cut. A specially formulated fuse aid coating is then applied, finally a cement protection is applied to the resistor body prior to marking with indelible ink.

TERMINATIONS

Material: Solder-coated copper wire.

Strength: The terminations meet the requirements of IEC 68.2.21.

Solderability: The terminations meet the requirements of IEC 115-1, Clause 4.17.3.2.

Marking: Resistors are color coded with 5 bands. Four of the bands are used to indicate values and tolerance, with IEC 62 colors being used. A fifth yellow band denotes constant voltage fusibility.

Solvent Resistance: The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

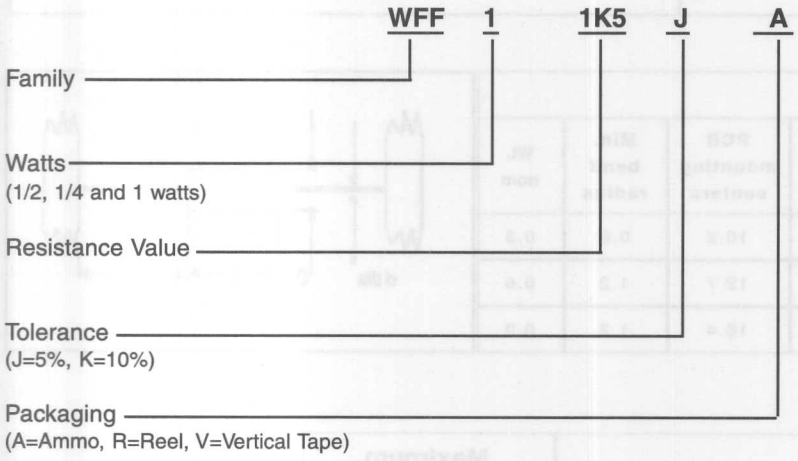
Flammability: The resistors will not burn or emit incandescent particles under any condition of applied temperature or power overload.

PACKAGING:

All resistors are supplied tape packed ready for loading onto automatic sequencing and insertion machines (vertical or horizontal) and also can be pre-formed in which case they will be packaged loose in plastic bags or boxes. Contact factory for packaging dimensions.

How to Order:

Sample Part Number:



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HIGH VALUE THICK FILM RESISTOR

ISO-9001 Registered

IRC

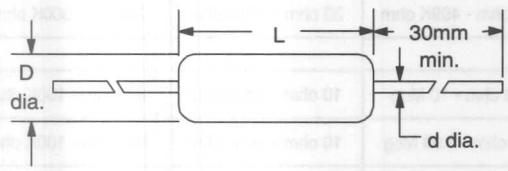
GC SERIES

- Value up to 1G ohm
- Tolerance down to 1%, 2%, 5%
- High stability thick film

ELECTRICAL DATA:

		GC65
Power Rating at 70°C	watts	0.5
Resistance Range	ohms	47K to 1G
Limiting Element Voltage	volts	3500
Isolation Voltage	volts	700
TCR (20 to 70°C)	ppm/°C	100
Resistance Tolerance (code)		1(F), 2(G), 5(J)
Standard Values		EIA 2% values prefered
Thermal Impedance	°C/watt	90
Operating Temperature Range	°C	-55 to 155

PHYSICAL DATA:



DIMENSIONS (Inches and (mm)) & WEIGHT (G)

Type	L max	D max	d nom	Wt nom
GC65	0.394 (10.0)	0.146 (3.7)	0.024 (0.6)	0.4

Construction:
Thick film material is fired onto high grade ceramic rods. Nickel plated steel caps are force fitted to the rods and the terminations are welded to the caps. The value is obtained by a helical cut in the film and, finally the resistor body is given a high temperature protective coating.

Terminations: Solder-coated copper wire.

Marking:
Type reference, TCR code, resistance value and, tolerance code are legend marked.

Solvent Resistance;
The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

PERFORMANCE DATA:

		Typical
Load at Rated Voltage: 1000hrs @ 70°C	ΔR%	0.1
Derating from Rated Power at 70°C		zero at 155°C
Climatic	ΔR%	1
Climatic Category		55/155/56

PACKAGING:

Loose packed in boxes or taped (on reel or in ammo box).
Standard Quantities Per Box/Spool:

Packaging	GC65	Packaging	GC65
Box	100	Taped (reeled)	5000
Large Box	1000	Taped (ammo box)	2000

HOW TO ORDER:

Specify type reference etc. as indicated in this example of GC65 2.5M ohms 1%, taped and ammo boxed.

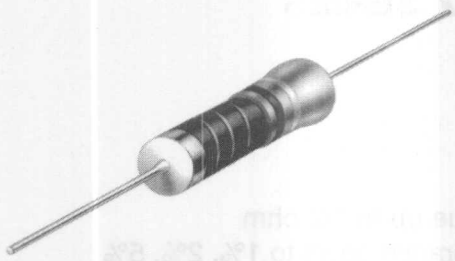
GC65 2M5 F Ammo

Type — GC65
Value — 2M5
Tolerance — F
Packaging Details — Ammo

PRECISION METAL FILM RESISTORS

ISO-9001 Registered

GP SERIES



- Meets requirements of MIL-R-10509
- 10 ohm - 10 megohm resistance range
- Flame-retardant coatings are standard
- Temperature coefficients from ±25 to ±100ppm/°C
- Resistance range tolerance of ±0.1% - 1%

PERFORMANCE CHARACTERISTICS (TESTED PER MIL-STD-202):

IRC TYPE	IRC POWER RATING (watts)		MIL REFERENCE	MAXIMUM WORKING VOLTAGE	RESISTANCE TEMPERATURE COEFFICIENT (±ppm/°C)	TOLERANCE & RESISTANCE RANGE		
	@ 70°C	@125°C				+1%	±.5%	±.25 and ±0.1%
GP-50 (T0)	1/8	1/10	RN50	200	100	10 - 2.37 Meg	10 ohm - 499K ohm	100 ohm - 100K ohm
GP-50 (T2)	1/8	1/10	RN50	200	50	10 ohm - 1 Meg	10 ohm - 499K ohm	100 ohm - 100K ohm
GP-50 (T9)	1/8	1/10	RN50	200	25	49.9 ohm - 499K ohm	49.9 ohm - 499K ohm	100 ohm - 100 K ohm
GP-55 (T0)	1/4	1/8	RN55	250	100	10 ohm - 10 Meg	10 ohm - 499K ohm	30 ohm - 300K ohm
GP-55 (T2)	1/4	1/8	RN55	250	50	10 ohm - 4.99 Meg	10 ohm - 499K ohm	30 ohm - 300K ohm
GP-55 (T9)	1/4	1/8	RN55	250	25	30 ohm - 499K ohm	30 ohm - 499K ohm	30 ohm - 300K ohm
GP-60 (T0)	1/2	1/4	RN60	350	100	10 ohm - 10 Meg	10 ohm - 499K ohm	100 ohm - 100K ohm
GP-60 (T2)	1/2	1/4	RN60	350	50	10 ohm - 4.99 Meg	10 ohm - 499K ohm	100 ohm - 100K ohm
GP-60 (T9)	1/2	1/4	RN60	350	25	49.9 ohm - 499K ohm	49.9 ohm - 499K ohm	100 ohm - 100K ohm

ENVIRONMENTAL (%ΔR)	MIL-R-10509			EIA RS-196
	Typical	Char. D	Char. C	Class 1
Moisture Resistance	±0.5	±1.5	±0.5	±1.5
Thermal Shock	±0.25	±0.5	±0.25	-
Load Life @ 70°C - 1000 hours	±0.5	±1.0	±0.5	±2.0
Shock and Vibration	±0.25	±0.5	±0.25	-
Resistance to Soldering Heat	±0.1	±0.5	±0.1	-
Terminal Strength	±0.2	±0.2	±0.2	-
Dielectric Withstand Voltage	±0.25	±0.5	±0.25	±0.5
Short Time Overload	±0.25	±0.5	±0.25	±0.5
Operating Temperature Range	-55°C to +165°C	-55°C to +165°C	-55°C to +165°C	
Maximum Pulse Voltage	GP50 400V, GP55 500V, GP60 600V			
Insulation Resistance	10,000 meg min.			
Voltage Coefficient	10ppm/V			

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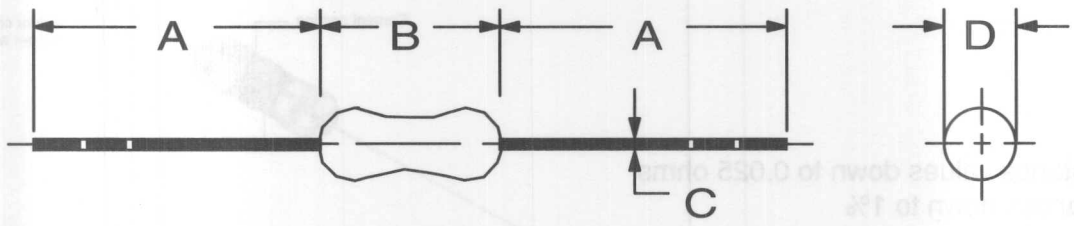
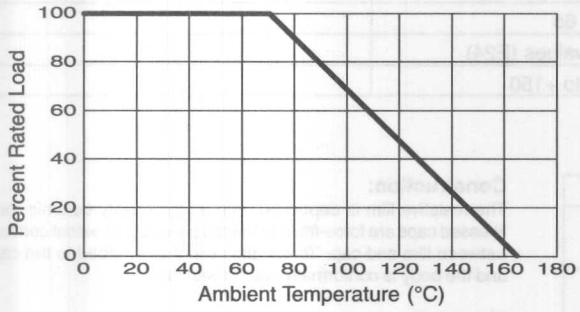
GP DIMENSIONS (Inches and (mm)):



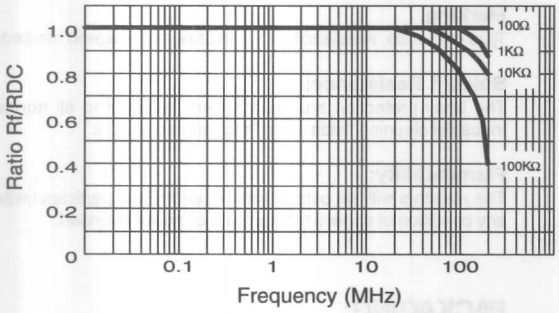
Dimension	GP50	GP55	GP60
A	1.10±.08 (28.0±2.0)	1.10±.08 (28.0±2.0)	1.10±.08 (28.0±2.0)
B	0.13 + .01/-.00 (3.2+0.2/-0.0)	0.24±.01 (6.0±0.3)	0.33±.02 (8.5±0.5)
C	0.018±.001 (0.45±0.02)	0.023±.002 (0.60±0.05)	0.027±.002 (0.70±0.05)
D	0.073±.006(1.85±0.15)	0.09±.01(2.4±0.2)	0.11±.01(2.8±0.3)

GP PERFORMANCE CURVES:

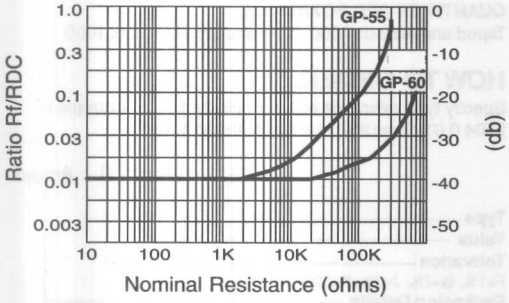
Derating Curve (Typical)



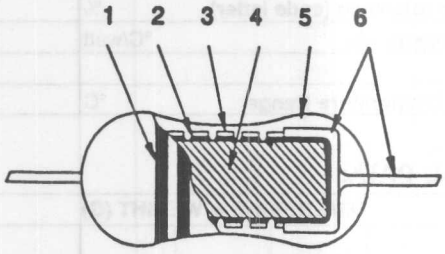
High-Frequency Characteristics (Typical)



Current Noise (Typical)



GP CONSTRUCTION:



1. COLOR BANDS.
The resistors are permanently color banded for resistance value and tolerance in accordance with EIA specifications.

2. HELIXING.
The units are helixed to a predetermined base to final value ratio to obtain the best TCR, noise and stability characteristics.

3. FILM.
Carbon-film resistors have a homogeneous film of pure carbon deposited by a pyrolitic process at carefully controlled temperatures.

4. SUBSTRATES.
The substrates are of a proprietary non alkaline ceramic, prepared and processed under exacting conditions to guarantee the utmost in uniformity and surface characteristics.

5. INSULATION.
The resistors are coated with multiple layers of a baked-on fire-retardant synthetic resin which provides the units with a high degree of mechanical and electrical protection in the most adverse operating conditions.

6. TERMINATIONS.
Positive contact is provided to the resistance element by precision-made end caps. The lead wires are attached by using proprietary welding techniques.

HOW TO ORDER:

Sample Part No.: **GP 55 100 1001 F**

IRC Type

Size

TCR

Resistance Value
3 digit range and 1 digit multiplier

Tolerance
F = 1%, D = .5%, C = .25%, B = .1%

Packaging: Bulk or Tape and Reel

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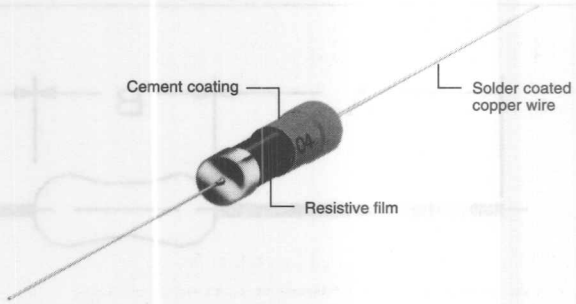
LOW VALUE METAL FILM RESISTOR

ISO-9001 Registered

2500 SERIES



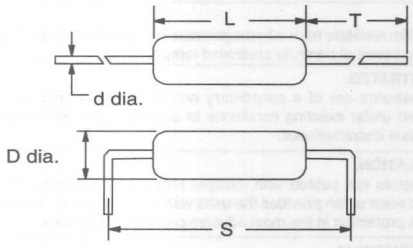
- Resistance values down to 0.025 ohms
- Tolerances down to 1%
- Low inductance
- Non-inflammable

SPECIFICATIONS:

		2504	Notes
Power Rating at 70°C	watts	1.5	
Resistance Range	ohms	0.025 to 1	
TCR (+20°C to +70°C)	ppm/°C	100 to 350	
Resistance tolerance (code letter)	%	1(F), 2(G), 5(J), 10(K)	Measured at 6mm from caps
Thermal Impedance	°C/watt	65	
Values		EIA 2% values (E24)	
Operating Temperature Range	°C	-55 to +150	

PHYSICAL DATA:

DIMENSIONS & WEIGHT (G)						
Type	L max	D max	T min	d nom	S min	Wt. nom
2504	0.571 (14.5)	0.201 (5.1)	1.181 (30)	0.031 (0.8)	0.720 (18.3)	1.1



Construction:
The resistive film is deposited onto a high quality ceramic rod. Pressed caps are force-fitted to the rod providing excellent contact between film and cap. Termination wires are welded to the cap and the body is conformally coated with cement.

Terminations:
Solder-coated copper wire.

Marking:
Type reference, resistance value and tolerance legend marked.

Solvent Resistance:
The body protection and marking are resistant to all normal industrial cleaning fluids suitable for printed circuits.

Flammability:
The resistors will not burn or emit incandescent particles under any condition of applied temperature or power overload.

PERFORMANCE DATA:

		Maximum	Typical
Load at Rated Power:1000 hrs at 70°C	ΔR%	2	1
Derating from Rated Power at 70°C		zero at 150°C	
Short Term Overload	ΔR%		0.25
Climatic	ΔR%	1	
Climatic Category		55/150/56	
Resistance to Solder Heat	ΔR%		0.1
Vibration and Bump	ΔR%		0.1

PACKAGING:

Tape packed onto reel or into ammopack, or loose in box.

QUANTITIES PER BOX/SPOOL:
Taped and reeled: 1000, Tape and ammo boxed: 1000

HOW TO ORDER:

Specify type reference etc. as indicated in the example of 2504 0.01 ohms 2%, taped and ammo boxed.

2504 0R01 G Ammo

Type
Value
Tolerance
F=1%, G=2%, J=5%, K=10%
Packaging Details

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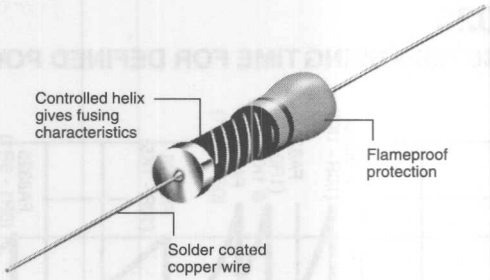
FUSIBLE METAL FILM RESISTOR

ISO-9001 Registered

FA8025 SERIES

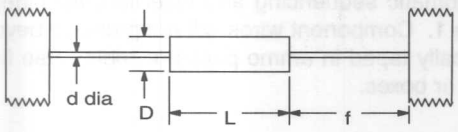


- Flameproof
- Predictable fusing characteristics

ELECTRICAL DATA:

Commercial		FA8225	FA8325	FA8425
Power Rating at 70°C	watts	0.25	0.5	1.5
Resistance Range	ohms	0.1 - 10K	0.1 - 27K	1 - 22K
Limiting Element Voltage	volts	250	350	500
TCR	ppm/°C	250	250	250
Resistance Tolerance	%	5		
Standard Values		2% EIA values preferred		
Thermal Impedance	°C/watt	140	90	70
Operating Temperature Range	°C	-55 to 155		

PHYSICAL DATA:



DIMENSIONS (Inches and (mm)) & WEIGHT (G)

Type	L max	D max	f min	d nom	PCB mounting centers	Min Bend Radius	Wt. nom
FA8225	.275 (7.0)	.090 (2.3)	.827 (21)	.024 (0.6)	.402 (10.2)	.024 (0.6)	0.3
FA8325	.394 (9.0)	.134 (3.4)	.772 (19.6)	.031 (0.8)	.500 (12.7)	.047 (1.2)	0.6
FA8425	.571 (14.5)	.201 (5.1)	.941 (23.9)	.031 (0.8)	.724 (18.4)	.047 (1.2)	1.1

Construction:
The metal film is deposited on a high purity ceramic rod. End caps are force fitted and termination wires welded to the caps. The resistive film is adjusted to the required value by a helical cut; finally the cement protection is applied to the resistor body and marked with indelible ink.

Termination: Solder-coated copper wire.

Marking:
Resistors are color coded with five bands. Four of the bands are used to indicate value and tolerance, with IEC 62 colors being used. A fifth yellow band denotes constant voltage fusibility.

Solvent Resistance:
The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

Flammability:
The resistors will not burn or emit incandescent particles under any condition of applied temperature or power overload.

PERFORMANCE DATA:

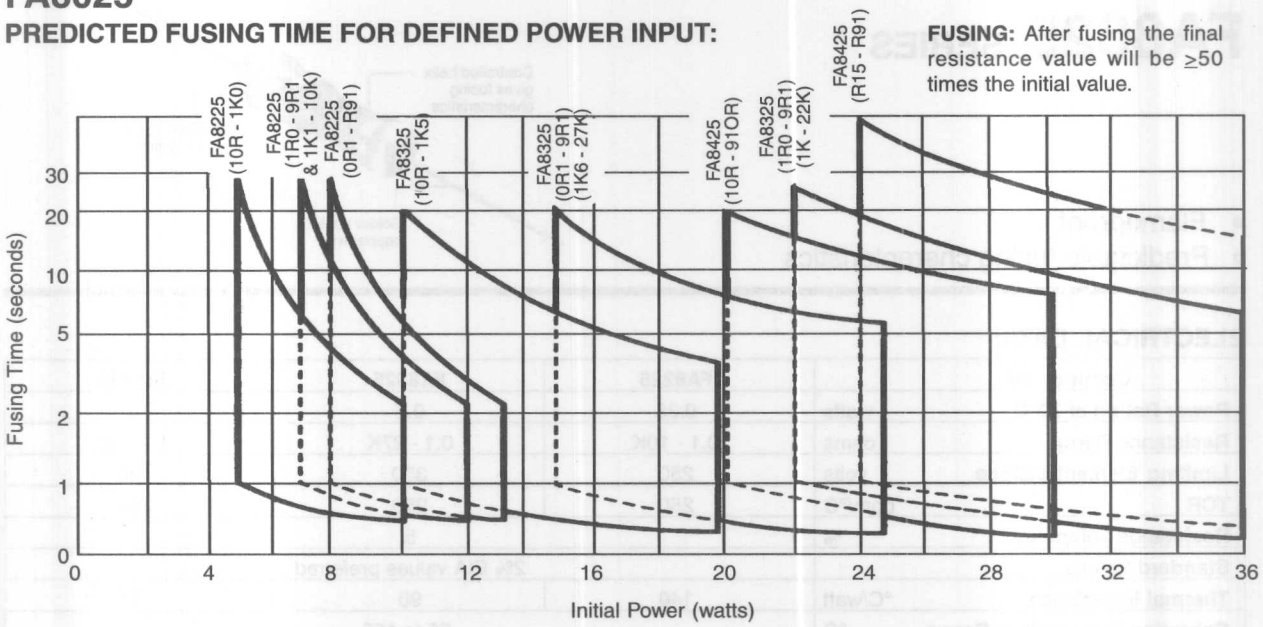
		Performance	
		Maximum	Typical
Load: 1000 hours at 70°C	ΔR%	2	0.5
Shelf Life: 12 months at room temperature	ΔR%	0.5	0.2
Derating from Rated Power at 70°C		zero at 155°C	
Temperature Rapid Change	ΔR%	0.5	0.2
Resistance to Solder Heat	ΔR%	0.5	0.2

ISO-9001 Registered

FA8025

PREDICTED FUSING TIME FOR DEFINED POWER INPUT:

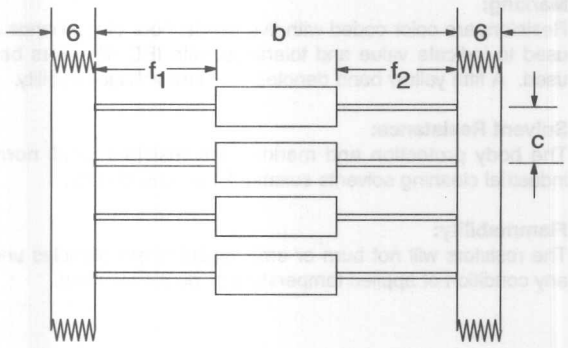
FUSING: After fusing the final resistance value will be ≥50 times the initial value.



PACKAGING:

All resistors are supplied tape packed ready for loading onto automatic sequencing and insertion machines. The standard taping method and critical dimensions are shown in figure 1. Component wires will not protrude beyond the outside edge of the tapes. FA8225 resistors can be supplied vertically taped in ammo packs or reels. See figure 2. FA8325/FA8425 can also be supplied loose packed in plastic bags or boxes.

Figure 1.



Type	b	c
FA8225	2.05 (52)	0.197 (5)
FA8325	2.05 (52)	0.197 (5)
FA8425	2.64 (67)	0.394 (10)

Standard Quantities Per Package

Type	Code	FA8225	FA8325	FA8425
Reel	R	5000	5000	1500
Large Ammo Pack	A	5000	2000	1000

HOW TO ORDER:

Specify type, reference etc. as indicated in this example of FA8325 1.1K ohms 5%, resistor taped and reeled.

FA8325 1K1 J R

Type — FA8325
Value — 1K1
Tolerance Codes — J
Packaging Details — R

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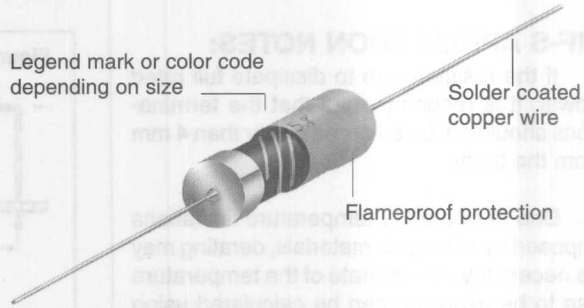
POWER METAL FILM RESISTOR

ISO-9001 Registered

MF-S SERIES

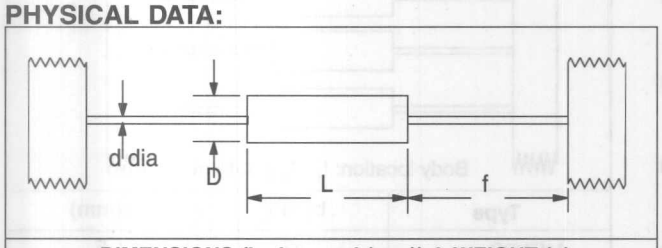


- Small size for power rating
- Range of 4 sizes: 0.5 watt to 3 watt at 70°C
- Flameproof protection

ELECTRICAL DATA:

		MF1/2S	MF1S	MF2S	MF3S
Power Rating at 70°C	watts	0.5	1.0	2.0	3.0
Resistance Range	ohms	0.1 - 1M		0.1 - 470K	
Limiting Element Voltage	volts	350			
TCR	ppm/°C	150		<1Ω:350	≥10Ω:150
Isolation Voltage	volts	500			700
Resistance Tolerance	%	≤1Ω:5, 10 >1Ω:1, 2, 5			
Standard Values		E24 Preferred			
Thermal Impedance	°C/watt	140	110	80	60
Operating Temperature Range	°C	-55 to 235			

PHYSICAL DATA:



DIMENSIONS (Inches and (mm)) & WEIGHT (g)

Type	L max	D max	f min	d nom	PCB mounting centers	Min Bend Radius	Wt. nom
MF1/2S	0.244 (6.2)	0.090 (2.3)	0.039 (21.0)	0.024 (0.6)	0.402 (10.2)	0.024 (0.6)	0.3
MF1S	0.354 (9.0)	0.134 (3.4)	0.772 (19.6)	0.031 (0.8)	0.500 (12.7)	0.047 (1.2)	0.5
MF2S	0.492 (12.5)	0.165 (4.2)	0.700 (17.8)	0.031 (0.8)	0.724 (18.4)	0.047 (1.2)	0.9
MF3S	0.571 (14.5)	0.201 (5.1)	0.937 (23.8)	0.031 (0.8)	0.799 (20.3)	0.047 (1.2)	1.1

Construction:
The resistive element is deposited onto a high thermal conductivity ceramic rod. End caps are force fitted and termination wires are welded to the caps. The element is adjusted to the required resistance value by a helical cut; finally a cement protection is applied to the resistor body before marking with indelible ink.

Termination:
MATERIAL: Solder coated copper wire.
STRENGTH: The terminations meet the requirements of IEC 68.2.21.
SOLDERABILITY: The terminations meet the requirements of IEC 115-1, Clause 4.17.3.2.

Marking:
MF1/2S & MF1S resistors are color coded with 4 bands. IEC 62 colors are used. For larger sizes type reference, resistance value marking conforms to IEC 62.

Solvent Resistance:
The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

Flammability:
The resistor coating will not burn or emit incandescent particles under any condition of applied temperature or power overload.

PERFORMANCE DATA:

		Maximum			Maximum
Loaded at Rated Power: 1000 hrs at 70°C	ΔR%	5	**Climatic Catergory**		40/125/56
Shelf Life: 12 months at room temperature	ΔR%	1	**Temperature Rapid Change**	ΔR%	0.5
Derating from Rated Power at 70°C		zero at 235°C	**Resistance to Solder Heat**	ΔR%	0.5
Climatic	ΔR%	1			

ISO-9001 Registered

IRC

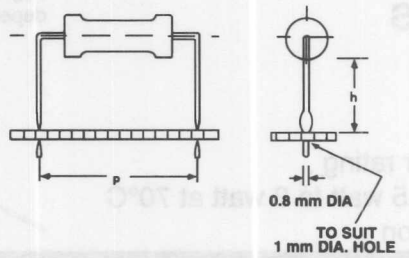
MF-S APPLICATION NOTES:

1. If the resistors are to dissipate full rated power, it is recommended that the terminations should not be soldered closer than 4 mm from the body.

2. Due to operating temperature limitations imposed by some pcb materials, derating may be necessary. An estimate of the temperature rise to be expected can be calculated using the thermal impedance figures given under Electrical Data.

3. MF-S resistors can also be supplied preformed. See Figure 1.

Figure 1.



Dimmensions mm		
Type	p	h
MF1/2-S	10	8
MF1-S	15	8
MF2-S	15	8
MF3-S	20	8

PACKAGING:

Our standard packaging method for MF-S resistors is tape packed ready for loading onto automatic sequencing and insertion machines.

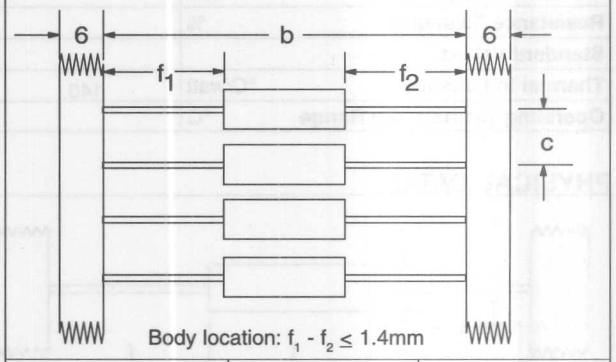
The standard taping method and critical dimensions are shown in Figure 2.

Component wires will not protrude beyond the outside edge of the tapes.

All taped resistors will be supplied either on reels on in ammo packs, depending upon quantities ordered.

Preformed resistors are supplied loose packed in plastic bags or boxes. This product and packaging is denoted code F.

Figure 2.



Type	b(mm)	c(mm)
MF1/2S	52	5
MF1S	52	5
MF2S	52	5
MF3S	67	10

HOW TO ORDER:

Specify type reference etc. as indicated in this example of MF2S 6.8K ohms 5% resistors, taped and reeled.

MF2S 6K8 J R

Type

Value
(Use IEC 62 code)

Tolerence
(Use IEC 62 code)
J=5%, K=10%

Packaging Details

Type	Code	MF1/2S	MF1S	MF2S	MF3S
Reel	R	5000	2500	2500	1000
Large Ammo Pack	A	5000	2500	2500	N/A
Small Ammo Pack	A	2000	1000	1000	N/A

WIREWOUND AND FILM TECHNOLOGIES DIVISION
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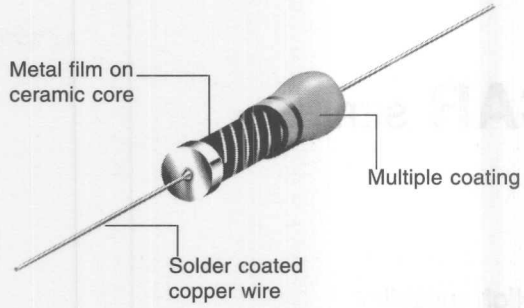
PRECISION METAL FILM RESISTORS

ISO-9001 Registered

PR4 SERIES



- Close tolerances down to ±0.1%
- Temperature coefficient ±25ppm/°C

Manufactured in the U.K. by Welwyn Components Ltd. a TT Group Company.

ELECTRICAL DATA:

Power Rating at 70°C	watts	025
Resistance Range	ohms	100-240K
Limiting Element Voltage	volts	250
TCR	ppm/°C	25
Resistance Tolerance	%	0.1, 0.25
Standard Values		E192
Thermal Impedance	°C/watt	140
Operating Temperature Range	°C	-55 to 155

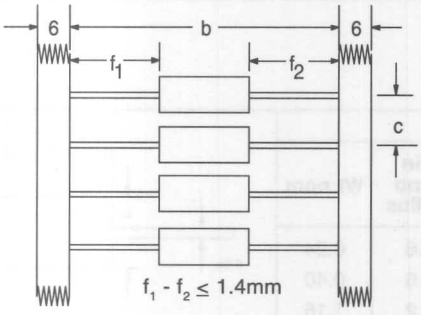
PERFORMANCE DATA:

		Maximum
Load: 1000 hrs at 70°C	ΔR%	0.5
Derating from Rated Power at 70°C		zero at 155°C
Short Term Overload	ΔR%	0.25
Climatic	ΔR%	0.5
Climatic Category		55/125/56
Long Term Damp Heat	ΔR%	0.5
Temperature Rapid Change	ΔR%	0.25
Resistance to Solder Heat	ΔR%	0.25
Vibration and Bump	ΔR%	0.1
Insulation Resistance	ohms	>1G
Voltage Proof	volts	400 min

PACKAGING:

All PR4 resistors are supplied tape packed ready for loading onto automatic sequencing and insertion machines. Component wires will not protrude beyond the outside edge of the tapes.

A detailed Packaging Data Sheet is available upon request.

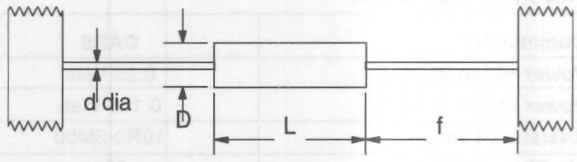


Vertically taped resistors can also be supplied. See packaging Data Sheet for details.

PHYSICAL DATA:

DIMENSIONS (inches and (mm)) & Weight (g):

Type	L max	D max	f min	d nom	PCB mounting centers	Min Bend Radius	Wt. nom
PR4	0.244 (6.2)	0.091 (2.3)	0.827 (21)	0.024 (0.6)	0.402 (10.2)	0.024 (0.6)	0.6



CONSTRUCTION

The resistance element is a precisely controlled thin film of metal alloy sputtered onto a highly dielectric strength coating applied so that terminations remain completely clear. This permits a well defined body length, (clean lead to clean lead dimension L.)

TERMINATIONS

MATERIAL: Solder-coated copper wire.
STRENGTH: The terminations meet the requirements of IEC 68.2.21
SOLDERABILITY: The terminations meet the requirements of IEC 115-1, Clause 4.17.3.2

MARKING

Resistors are color coded with 5 bands.

SOLVENT RESISTANCE

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

Standard Quantities Per Box/Spool:

Type	Code	PR4
Reel	R	5000
Large Ammo Pack	A	4000
Small Ammo Pack	A	2000

HOW TO ORDER:

Specify type reference etc. as indicated in this example of PR4 6.8K ohms 0.1% resistor, taped and reeled.

Sample Part No: **PR4 6K8 B R**

Type
Value
Tolerence
B=0.1%, C+0.25%
Packaging Details

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ULTRA PRECISION METAL FILM RESISTOR

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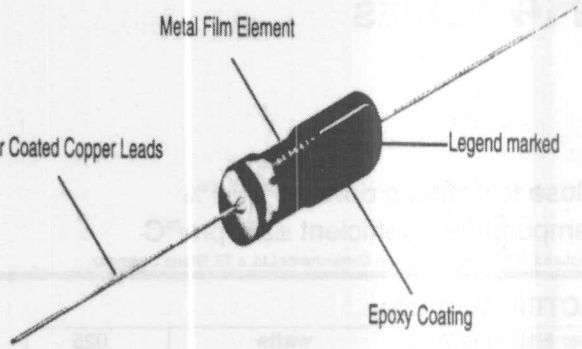
CAR SERIES



- High reliability
- Ultra low temperature coefficient
- Low noise
- Superior moisture performance
- Non standard value available
- Highest stability metal film available
- Matched sets and networks

ELECTRICAL DATA

Commercial	CAR5	CAR6	CAR7
Power rating @ 70°C	0.25 Watt	0.33 Watt	0.50 Watt
Power rating @ 85°C	0.125 Watt	0.25 Watt	0.25 Watt
Resistance range	10R0-3M00	10R0-5M00	10R0-10M0
Limiting element voltage	250	350	500
TCR (-20 to +85°C)PPM/°C	5 (V), 10 (T), 15 (Y), 25 (D), 50 (C)		
Resistance tolerance	0.01 (L), 0.02 (P), 0.05 (W), 0.10 (B), 0.25 (C), 0.50 (D), 1.0 (F)		
Thermal impedence	110°C/Watt	70°C/Watt	55°C/Watt
Ambient temperature range	-55 to +155	-55 to +155	-55 to +155

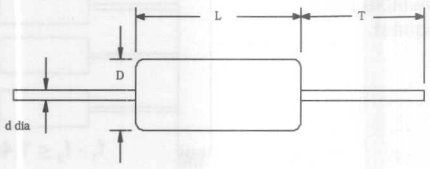
BEST TOLERANCE/TCR COMBINATION

TCR	CAR5			CAR6			CAR7		
PPM/°C	Tolerance			Tolerance			Tolerance		
	0.01-0.02%	0.05%	0.10-0.1%	0.01-0.02%	0.05%	0.10-0.1%	0.01-0.2%	0.5%	0.10-1.0%
5	50R-250K	10R-250K	10R-300K	50R-500K	10R-500K	10R-500K	50R-1M0	10R-1M0	10R-1M0
10	50R-250K	10R-250K	10R-350K	50R-500K	10R-500K	10R-700K	50R-1M0	10R-1M0	10R-1M5
15	50R-250K	10R-250K	10R-500K	50R-500K	10R-500K	10R-1M0	50R-1M0	10R-1M0	10R-3M5
25	50R-250K	10R-250K	10R-1M5	50R-500K	10R-500K	10R-3M0	50R-1M0	10R-1M0	10R-5M0
50	50R-250K	10R-250K	10R-3M0	50R-500K	10R-500K	10R-5M0	50R-1M0	10R-1M0	10R-10M

PHYSICAL DATA:

DIMENSIONS (mm) & WEIGHT (g)

Type	L max	D max	T min	d nom	PCB mounting centers	Min Bend Radius	Wt nom
CAR5	7.2	2.5	30	0.6	10.2	0.6	0.24
CAR6	10.0	3.7	30	0.6	12.7	0.6	0.40
CAR7	15.5	5.5	30	0.8	18.4	1.2	1.15



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CAR PERFORMANCE DATA

	CAR 5 & 6 <500K CAR 7 <1M00		CAR 5 & 6 >500K CAR 7 >1M00	
	MAXIMUM	TYPICAL	MAXIMUM	TYPICAL
1000 Hour Load Life				
0.125 Watt at 85 C	0.05%	0.02%	0.25%	0.05%
0.250 Watt at 70 C	0.05%	0.02%	0.25%	0.05%
Short Time Over Load	0.01%	0.001%	0.08%	0.01%
Resistance to Solder Heat	0.02%	0.003%	0.05%	0.005%
High Temp Expose		0.08%		0.2%
Power Derating	ZERO @	155°C	ZERO @	155°C
Thermal Shock	0.04%	0.02%	0.25%	0.05%
Noise		0.03uV/V		0.1 uV/V
Voltage Coefficient		<0.05 ppm/V		<0.1 ppm/V
Moisture	0.04%	0.02%	0.20%	0.05%
Vibration	0.02%	0.002%	0.06%	0.02%
Climatic Category	55/155/56		55/155/56	
Shelf Life (12 Month)		0.003%		0.02%

MATCHED SETS AND NETWORKS

IRC has many years of experience in the supply of matched sets of precision resistors.

Refer to application notes for more details.

INQUIRIES WELCOME

APPLICATION NOTES

Resistors can be supplied matched for tolerance and TCR down to ±0.005% and ±1pmm/°C, either as separate resistors or pre-assembled and encapsulated within a plastic box.

The individual resistors within a set or module can be manufactured with a tolerance of ±0.01% and a TCR of ±5ppm/°C.

PACKAGING

The standard packaging is loose in boxes. Taped resistors (on reel or in ammo pack) can also be supplied by special request. In case the usable length is reduced by the width of the tape. A detail taping specification is available on request.

STANDARD QUANTITIES PER PACKAGE

TYPE	CAR 5	CAR 6	CAR 7
BULK	250	125	50
AMMO	1000	1000	N/A
REEL	1000	2500	N/A

ORDERING PROCEDURE

Specify type reference etc. as indicated in this example of CARS 6.8K ohms 0.1% 50ppm/°C.

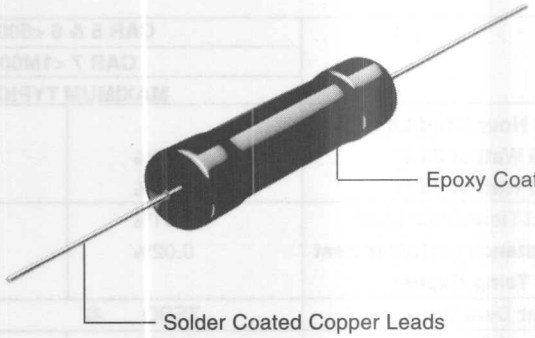
CAR5 C 6K8 B B

- **Type** — CAR5
- **TCR (see Electrical Data for code** — C
- **Value (USE IEC 62 code** — 6K8
- **Tolerance** — B
- **Packaging details** — B

PRECISION METAL FILM RESISTORS

ISO-9001 Registered

RC SERIES



- CECC released products with low TCRs over a wide resistance range
- Close resistance tolerance down to 0.05%
- Low noise and negligible voltage coefficient
- Matched sets available

ELECTRICAL DATA

Commercial		RC55	RC65	RC70
Power Rating at 70°C	watts	0.25	0.5	1
Resistance Range	ohms	1 to 4M	1 to 4M	1 to 10M
Limiting Element Voltage	volts	350	350	500
Isolation Voltage	volts	500	500	700
TCR (-20° to +85°C)	ppm/°C	5ppm-100ppm	5ppm-100ppm	5ppm-100ppm
Resistance Tolerance	%	.05%-1%	.05%-1%	.05%-1%
Standard Values		E24, E96 preferred	E24, E96 preferred	E24, E96 preferred
Thermal Impedance	°C/watts	120	80	60
Ambient Temp. Range	°C	-55 to +155	-55 to +155	-55 to +155

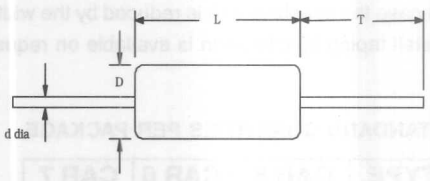
BEST TOLERANCE/TCR COMBINATION

TCR ppm/°C	RC55			RC65			RC70		
	.05%	.1-.25%	.5-1%	.05%	.1-.25%	.5-1%	.05%	.1-.25%	.5-1%
5	10 to 500K	10 to 500K	1 to 500K	10 to 500K	10 to 500K	1 to 500K	10 to 1M	10 to 750K	1 to 750K
10	10 to 1M	10 to 1M	1 to 1M	10 to 500K	10 to 1M	1 to 1M	10 to 1M	10 to 1M	1 to 1M
15	10 to 1M	5 to 1M	1 to 1M	10 to 500K	5 to 1M	1 to 1M	10 to 1M	10 to 2M	1 to 2M
25	10 to 1M	5 to 2M	1 to 2M	10 to 500K	5 to 2M	1 to 2M	10 to 1M	10 to 5M	1 to 5M
50	10 to 1M	5 to 2M	1 to 4M	10 to 500K	5 to 2M	1 to 4M	10 to 1M	5 to 10M	1 to 10M
100	10 to 1M	5 to 2M	1 to 4M	10 to 500K	1 to 2M	1 to 4M	10 to 1M	1 to 10M	1 to 10M

PHYSICAL DATA:

DIMENSIONS (mm) & WEIGHT (g)

Type	L max	D max	T min	d nom	PCB mounting centers	Min Bend Radius	Wt nom
RC55	7.2	2.5	30	0.6	10.2	0.6	0.24
RC65	10.0	3.7	30	0.6	12.7	0.6	0.40
RC70	15.5	5.5	30	0.8	18.4	1.2	1.15



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IRC

RC SERIES PERFORMANCE DATA:

		Actual Performance	
		Maximum	Typical
Load Life @ Rated Power: 1000 hrs at 70°C	**ΔR%**	0.05	0.04
Load Life @ Rated Power:1000 hrs at 125°C	**ΔR%**	0.06	0.05
High Temp. Exposure: 2000 hrs at 175°C	**ΔR%**	0.1	0.05
Derating From Rated Power at 70°C		0 to 150°C	
Short Time Overload	**ΔR%**	0.01	0.01
Moisture Resistance	**ΔR%**	0.3	0.1
Thermal Shock	**ΔR%**	0.05	0.02
Resistance To Solder Heat	**ΔR%**	0.06	0.03
Shock & Vibration	**ΔR%**	0.05	0.02
Noise (in a decade of frequency)	**μV/V**	0.1	0.01
Voltage Coefficient of Resistance	**ppm/V**		<1

Best Tolerence/TCR Combination For Low Resistance Values

Lowest Resistance Values Obtainable (ohms)					
	Tolerance (%)				
TCR (ppm/°C)	**1**	**0.5**	**0.25**	**0.1**	**0.05**
5	1	1	10	10	10
10	1	1	10	10	10
15	1	1	10	10	10
25	1	1	10	10	10
50	1	1	5	5	10
100	1	1	1	1	10

PACKAGING:

The standard packaging is loose in boxes. Taped resistors (on a reel or in ammo pack) can also be supplied. A detailed taping specification is available upon request.

STANDARD QUANTITIES PER PACKAGE

Type	Code	RC55	RC65	RC70
Std. Box	B	1000	500	35
Large Box	B	2000	1000	250
Reel	R	5000	2500	
Ammo Pack	A	1000	1000	

HOW TO ORDER:

Specify type reference etc. as indicated in this example of RC 55 6.8K ohms 0.1% 50 ppm/°C.

Sample Part No. **RC55 C 6K8 B B**

Type

TCR 5(V),10(T),15(Y), 25(D), 50(C)

Value

Tolerance

W=0.05%, B=0.1%, C=0.25%, D=0.5%, F=1.0%

Packaging details

B = Bulk, T = Tape & Reel, A = Ammo Pack

ULTRA PRECISION METAL FILM RESISTOR

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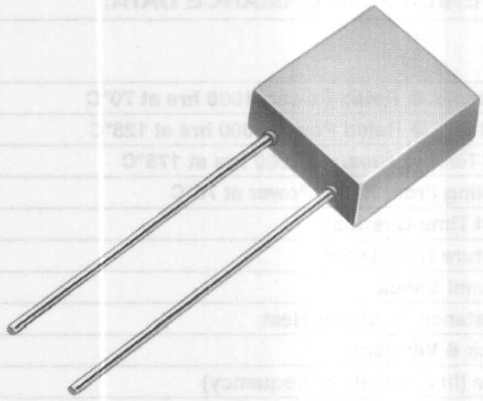
MAR40/42 SERIES



- High power ultra-precision resistor
- Tight temperature coefficient to ±2ppm/°C
- High reliability construction
- Tolerance to ±0.005%
- Both 0.15" and 0.200" lead spacing available

NOTE: See MAR Series for construction features

The MAR40/42 Series of Ultra-precision resistors combines the benefits of proven IRC metal film reliability, non-measurable noise, and superior frequency response with very low temperature characteristics, convenient radial lead design, and efficient use of printed circuit board "real estate."

The shelf life and load life stability characteristics are derived from our expertise with the MAR Series of axial leaded resistors. The physical size coincides nicely with military standard RNC90. The internal construction utilizes the high reliability, "end cap" technology of the MAR. In short, the design engineers can take an effective step towards product reliability and long, service-free life, by specifying the MAR40/42. The MAR40/42 may be specified to any custom value needed and/or purchased in matched sets with tolerances placed on the nominal ratios and close tracking of temperature coefficients.

The MAR40/42 ultra-precision resistor can be made to exact specifications without the usual delays in delivery of prototypes. The flexibility of the MAR40/42 manufacturing process allows quick response to customer delivery.

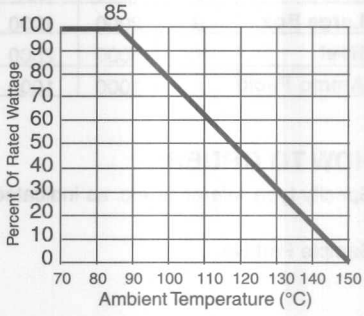
SPECIFICATIONS:

IRC Type	TC Code	Standard Temperature Coefficient		Standard Resistance Range (ohms)	Resistance Tolerance (±)	Power Rating (watts)	Voltage Rating (volts)
MAR40/ MAR42	T16	0 ±5ppm/°C	0 to 60°C	20 to 400K	0.005, 0.01, 0.02, 0.05, 0.1, 0.25, 0.5, 1	0.3	250
		0 ±10ppm/°C	-55°C to+125°C				
MAR40/ MAR42	T18	0 ±2ppm/°C	0 to 60°C	20 to 400K		0.3	250
		0 ±5ppm/°C	-55°C to+125°C				

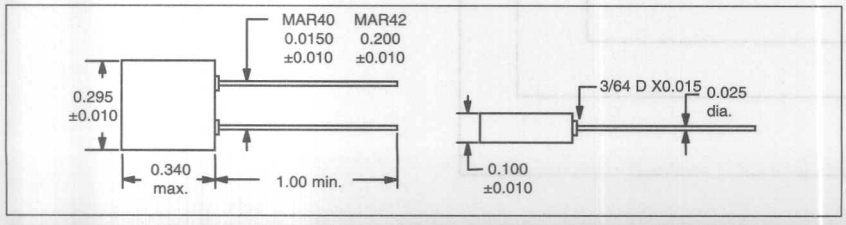
PERFORMANCE DATA:

Test conditions per MIL-R-55182, Except Where Noted	Typical ΔR%
1,000 Hour Loadlife (rated power @ 85°C)	±0.02
Humidity	±0.02
Thermal Shock (tested per method 107, MIL-STD 202, Condition F)	±0.01
Effect of Solder (tested per method 210, MIL-STD 202)	±0.01
Dielectric Withstanding	±0.01
Shock and Vibration	±0.01
Short Time Overload	±0.01
Insulation Resistance	10,000 Meg
Noise Index	-30 dB
Voltage Coefficient	<0.05 ppm/V
1-Year Shelf Life	±30ppm

POWER DERATING:



DIMENSIONS (Inches):



HOW TO ORDER:

Sample Part No:

MAR40 T16 91K 0.02

- **IRC Type** — MAR40
- **Temperature Coefficient** — T16 (±5 ppm), T18 (±2 ppm)
- **Resistance** — 91K
- **Tolerance** — 0.02

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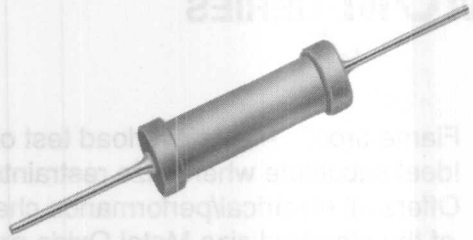
METAL OXIDE RESISTORS

ISO-9001 Registered

MO SERIES

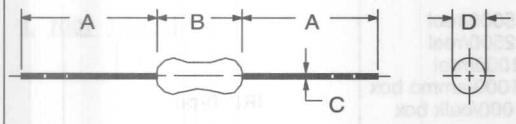


- Flameproof
- Meets overload test of UL#1412
- Meets solvent test of method 215 of MIL-STD-202
- Low cost alternative for power carbon composition and wirewounds
- TCR ±200 ppm
- Coating meets UL-94V-0

PERFORMANCE CHARACTERISTICS (Tested Per MIL-R-22684 Rev. C):

ELECTRICAL	MO 1/2	MO 1	MO 2	MO 3	MO 5
Power Ratings @ 70°C (watts)	1/2	1	2	3	5
Derated to 0 Load at	200°C	200°C	200°C	200°C	200°C
Maximum Working Voltage (volts)	250	350	350	500	750
Operating Temperature Range	-55°C to +200°C	-55°C to +200°C	-55°C to +200°C	-55°C to +200°C	-55°C to +200°C
Resistance Range (ohms)	0.1 - 75K (±5%) 0.1 - 75K (±1%)	0.1 - 120K (±5%) 0.1 - 100K (±1%)	0.1 - 150K (±5%) 0.1 - 120K (±1%)	1 - 150K (±5%) 10 - 10K (±1%)	1 - 180K (±5%) 10 - 10K (±1%)
Environmental (Operating Temperature Range: -55°C to +200°C)					
Moisture Resistance	±1.5%	±1.5%	±1.5%	±1.5%	±1.5%
Thermal Shock	±1%	±1%	±1%	±1%	±1%
Load Life @ 70°C - 1000 hrs.	±2%	±2%	±2%	±2%	±2%
Shock and Vibration	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
Resistance to Soldering Heat	±0.55+0.05Ω	±0.55+0.05Ω	±0.55+0.05Ω	±0.55+0.05Ω	±0.55+0.05Ω
Terminal Strength	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
Dielectric Withstand Voltage	400V RMS	700V RMS	700V RMS	800V RMS	800V RMS
Maximum Pulse Voltage	400V	750V	1000V	1500V	1500V
Insulation Resistance	10,000 meg min.	10,000 meg min.	10,000 meg min.	10,000 meg min.	10,000 meg min.
Voltage Coefficient	0.001%/V	0.001%/V	0.001%/V	0.001%/V	0.001%/V
Short Time Overload	±(0.5+0.05Ω)	±(0.5+0.05Ω)	±(0.5+0.05Ω)	±(0.5+0.05Ω)	±(0.5+0.05Ω)

DIMENSIONS (Inches and



PACKAGING:

MO 1:	2500/reel
MO 2:	1000/reel
MO 3:	1000/ammo box
MO 5:	1000/bulk box
All Above:	1000/bulk box

	A	B	C	D
MO 1/2	1.10±0.08 (28.0±2.0)	0.35±0.04 (9.0±1.0)	0.028±0.002 (0.70±0.05)	0.12±0.02 (3.0±0.5)
MO 1	1.10±0.08 (28.0±2.0)	0.43±0.04 (11.0±1.0)	0.028±0.002 (0.70±0.05)	0.16±0.02 (4.0±0.5)
MO 2	1.50±0.12 (38.0±3.0)	0.59±0.02 (15.0±0.5)	0.031±0.002 (0.80±0.05)	0.22±0.02 (5.5±0.5)
MO 3	1.50±0.12 (38.0±3.0)	0.98±0.04 (25.0±2.0)	0.031±0.002 (0.80±0.05)	0.34±0.04 (8.5±1.0)
MO 5	1.50±0.12 (38.0±3.0)	1.61±0.04 (41.0±1.0)	0.031±0.002 (0.80±0.05)	0.34±0.04 (8.5±1.0)

HOW TO ORDER:

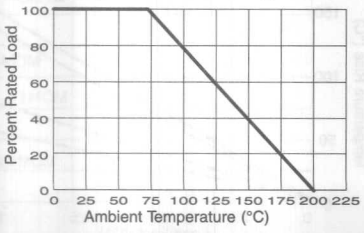
Sample Part No.:

MO-1 1001 J

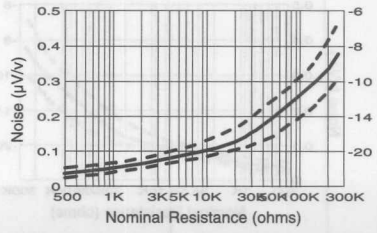
- **IRC Type** — MO-1
- **Size** — 1
- **Resistance Value** — 1001
  3 digit range and 1 digit multiplier
- **Tolerance** — J
  J = 5%, F = 1%

PERFORMANCE CURVES:

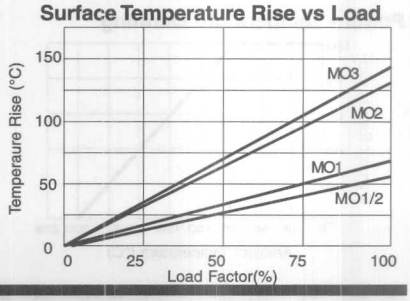
Power - Temperature Derating



Current Noise



Surface Temperature Rise vs Load

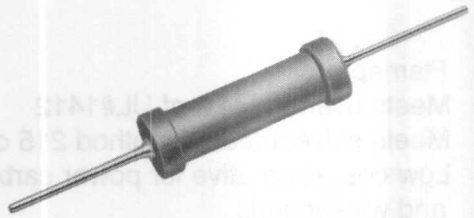


METAL OXIDE MINI SERIES RESISTORS

ISO-9001 Registered

IRC

MOM SERIES

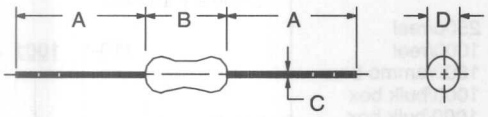


- Flame proof - Meets overload test of UL #1412
- Ideal substitute where size restraints apply
- Offers all electrical/performance characteristics of the standard size Metal Oxide product
- TCR ±200 ppm

PERFORMANCE CHARACTERISTICS (Tested Per MIL-R-22684 Rev. C):

ELECTRICAL	MOM 1/2	MOM 1	MOM 2	MOM 3	MOM 5
Power Ratings @ 70°C (watts)	1/2	1	2	3	5
Derated to 0 Load at	200°C	200°C	200°C	200°C	200°C
Maximum Working Voltage (volts)	250	350	350	350	500
Operating Temperature Range	-55°C to +200°C	-55°C to +200°C	-55°C to +200°C	-55°C to +200°C	-55°C to +200°C
Resistance Range (ohms)	0.1 - 47K (±5%) 0.1 - 47K (±1%)	0.1 - 75K (±5%) 0.1 - 75K (±1%)	0.1 - 100K (±5%) 0.1 - 100K (±1%)	0.1 - 120K (±5%) 0.1 - 120K (±1%)	1 -150K (±5%) 100 - 4.99K (±1%)
Environmental (Operating Temperature Range: -55°C to +200°C)					
Moisture Resistance	±1.5%	±1.5%	±1.5%	±1.5%	±1.5%
Thermal Shock	±1%	±1%	±1%	±1%	±1%
Load Life @ 70°C - 1000 hrs.	±2%	±2%	±2%	±2%	±2%
Shock and Vibration	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
Resistance to Soldering Heat	±0.55+0.05Ω	±0.55+0.05Ω	±0.55+0.05Ω	±0.55+0.05Ω	±0.55+0.05Ω
Terminal Strength	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
Dielectric Withstand Voltage	400V	600V	600V	600V	800V
Maximum Pulse Voltage	400V	750V	750V	750V	1000V
Insulation Resistance	10,000 meg min.	10,000 meg min.	10,000 meg min.	10,000 meg min.	10,000 meg min.
Voltage Coefficient	0.001%/V	0.001%/V	0.001%/V	0.001%/V	0.001%/V
Short Time Overload	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)

DIMENSIONS (Inches and



PACKAGING:

MOM 1/2:	5000/reel
MOM 1, 2:	2500/reel
MOM 3:	1000/reel
MOM 5:	1000/ammo box
All Above:	1000/bulk box

	A	B	C	D
MOM 1/2	1.10±0.08 (28.0±2.0)	0.24±0.01 (6.0±0.3)	0.024±0.002 (0.60±0.05)	0.09±0.01(2.3±0.2)
MOM 1	1.10±0.08 (28.0±2.0)	0.35±0.04 (9.0±1.0)	0.028±0.002 (0.70±0.05)	0.12±0.02(3.0±0.5)
MOM 2	1.10±0.08 (28.0±2.0)	0.43±0.04 (11.0±1.0)	0.031±0.002 (0.80±0.05)	0.16±0.02(4.0±0.5)
MOM 3	1.50±0.12 (38.0±3.0)	0.59±0.02 (15.0±0.5)	0.031±0.002 (0.80±0.05)	0.22±0.02(5.5±0.5)
MOM 5	1.50±0.12 (38.0±3.0)	0.98±0.04 (25.0±2.0)	0.031±0.002 (0.80±0.05)	0.34±0.04(8.5±1.0)

HOW TO ORDER:

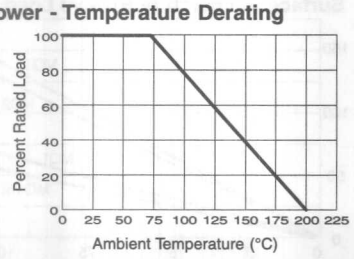
Sample Part No.:

MOM-1 1001 J

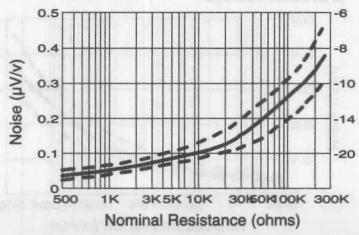
- **IRC Type** — MOM-1
- **Size** — 1
- **Resistance Value** — 1001
  3 digit range and 1 digit multiplier
- **Tolerance** — J
  J = 5%, F = 1%

PERFORMANCE CURVES:

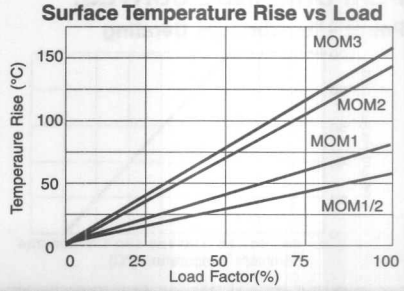
Power - Temperature Derating



Current Noise



Surface Temperature Rise vs Load



WIREWOUND AND FILM TECHNOLOGIES DIVISION
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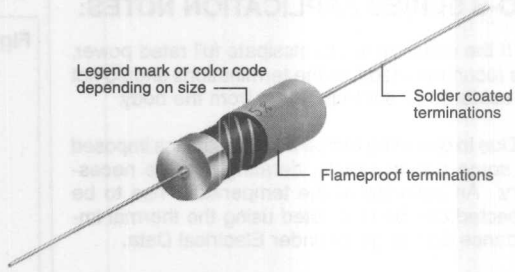
POWER METAL OXIDE RESISTOR

ISO-9001 Registered

MO-S SERIES

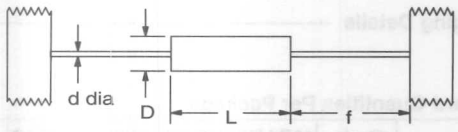


- Small size for power rating
- Range of 5 sizes: 0.5 watt to 5 watt at 70°C
- Flameproof protection

ELECTRICAL DATA:

		MO1/2S	MO1S	MO2S	MO3S	MO5S
Power Rating at 70°C	watts	0.5	1.0	2.0	3.0	5.0
Resistance Range	ohms	10 - 50K	10 - 100K			
Limiting Element Voltage	volts	250	350			500
TCR	ppm/°C	350				
Isolation Voltage	volts	350	500			700
Resistance Tolerance	%	5, 10				
Standard Values		E24 Preferred				
Thermal Impedance	°C/watt	140	110	80	60	35
Operating Temperature Range	°C	-55 to +155				

PHYSICAL DATA:



DIMENSIONS (Inches and (mm)) & WEIGHT (G)

Type	L max	D max	f min	d nom	PCB mounting centers	Min Bend Radius	Wt. nom
MO1/2S	0.244 (6.2)	0.090 (2.3)	0.039 (21.0)	0.024 (0.6)	0.402 (10.2)	0.024 (0.6)	0.3
MO1S	0.354 (9.0)	0.134 (3.4)	0.772 (19.6)	0.031 (0.8)	0.500 (12.7)	0.047 (1.2)	0.5
MO2S	0.492 (12.5)	0.165 (4.2)	0.700 (17.8)	0.031 (0.8)	0.724 (18.4)	0.047 (1.2)	0.9
MO3S	0.571 (14.5)	0.201 (5.1)	0.937 (23.8)	0.031 (0.8)	0.799 (20.3)	0.047 (1.2)	1.1
MO5S	0.984 (25.0)	0.335 (8.5)	1.086 (27.6)	0.031 (0.8)	1.236 (31.4)	0.047 (1.2)	4.3

Construction:
The Tin Oxide resistance element is deposited onto a high purity ceramic rod. End caps are force fitted and termination wires are welded to the end caps. The element is adjusted to the required resistance value by a helical cut; finally a cement protection is applied to the resistor body prior to marking with indelible ink.

Termination:
MATERIAL: Resistor sizes up to and including the MO3-S use solder coated copper terminations. MO5-S use solder coated steel cored terminations.
STRENGTH: The terminations meet the requirements of IEC 68.2.21.
SOLDERABILITY: The terminations meet the requirements of IEC 115-1, Clause 4.17.3.2.

Marking:
MO1/2S & MO1S resistors are color coated with 4 bands. IEC 62 colors are used. For larger sizes type reference, resistance value and tolerance are legend marked. The resistance value marking conforms to IEC 62.

Solvent Resistance:
The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

Flammability:
The resistor coating will not burn or emit incadescent particles under any condition of applied temperature or power overload.

PERFORMANCE DATA:

		Maximum			Maximum
Load at Rated Power: 1000 hrs at 70°C	ΔR%	5	Climatic Category		40/125/56
Shelf Life: 12 months at room temperature	ΔR%	2	Temperature Rapid Change	ΔR%	0.5
Derating from Rated Power at 70°C		zero at 235°C	Resistance to Solder Heat	ΔR%	0.5
Climatic	ΔR%	1			

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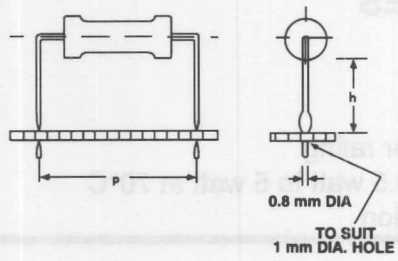
MO-S SERIES APPLICATION NOTES:

1. If the resistors are to dissipate full rated power, it is recommended that the terminations should not be soldered closer than 4 mm from the body.

2. Due to operating temperature limitations imposed by some pcb materials, derating may be necessary. An estimate of the temperature rise to be expected can be calculated using the thermal impedance figures given under Electrical Data.

3. MO-S resistors can also be supplied pre-formed. See Figure 1.

Figure 1



Dimensions mm		
Type	p	h
MO1/2-S	10	8
MO1-S	15	8
MO2-S	15	8
MO3-S	20	8
MO5-S	30	8

PACKAGING:

Our standard packaging method for MO-S resistors is tape packed ready for loading onto automatic sequencing and insertion machines.

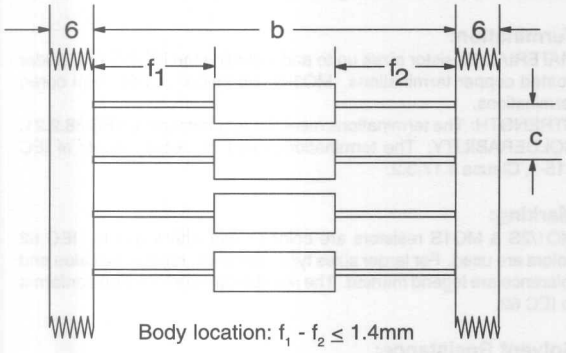
The standard taping method and critical dimensions are shown in Figure 2.

Component wires will not protrude beyond the outside edge of the tapes.

All taped resistors will be supplied either on reels or in ammo packs, depending upon quantities ordered.

Pre-formed resistors are supplied loose packed in plastic bags or boxes. This product and packaging is denoted code F.

Figure 2.



Type	b	c
MO1/2S	52	5
MO1S	52	5
MO2S	52	5
MO3S	67	10
MO5S	85	10

HOW TO ORDER:

Specify type reference etc. as indicated in this example of MO2S 6.8K ohm 5% resistors, taped and reeled.

MO2S 6K8 J R

Type

Value
(Use IEC 62 code)

Tolerance
(Use IEC 62 code)
J = 5%, K = 10%

Packaging Details

Standard Quantities Per Package

Type	Code	MO1/2S	MO1S	MO2S	MO3S	MO5S
Reel	R	5000	2500	2500	1000	700
Large Ammo Pack	A	5000	2500	1500	1000	-
Small Ammo Pack	A	2000	1000	1000	1000	-

WIREWOUND AND FILM TECHNOLOGIES DIVISION
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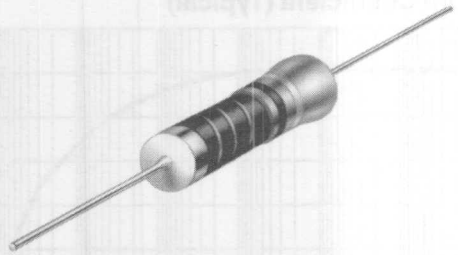
GENERAL PURPOSE CARBON FILM RESISTORS

ISO-9001 Registered

IRC

CF SERIES



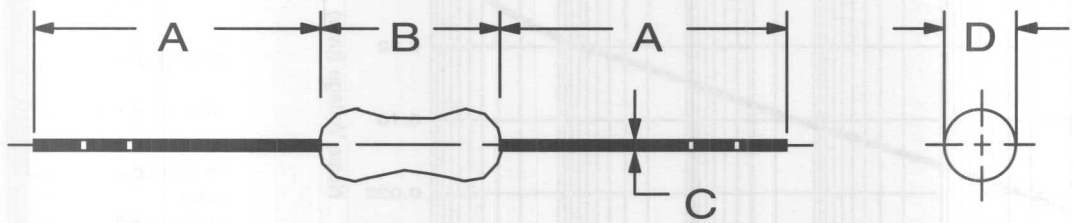
- High stability performance
- Uniformity of all electrical parameters
- Ideal for commercial/industrial applications
- Auto sequencing/insertion compatible

PERFORMANCE CHARACTERISTICS (TESTED PER MIL-STD-202):

ELECTRICAL	CF 1/8	CF 1/4	CF 1/2
Power Rating (watts) @ 70°C	1/8	1/4	1/2
Derated to 0 Load at	155°C	155°C	155°C
Maximum Working Voltage	200V	250V	350V
Operating Temperature Range	-55°C to +155°C	-55°C to +155°C	-55°C to +155°C
Resistance Range (±5%)	1.0Ω - 22 meg	1.0Ω - 22 meg	1.0Ω - 22 meg
(±2%)	10Ω - 1 meg	10Ω - 4.7 meg	10Ω - 4.7 meg

ENVIRONMENTAL			
Moisture Resistance	<100K±(3%+0.05Ω)	<100K±(3%+0.05Ω)	<100K±(3%+0.05Ω)
	>100K±(5%+0.05Ω)	>100K±(5%+0.05Ω)	>100K±(5%+0.05Ω)
Thermal Shock	±0.5%	±0.5%	±0.5%
Load Life @ 70°C - 1000 hours	<100K±(2%+0.05Ω)	<100K±(2%+0.05Ω)	<100K±(2%+0.05Ω)
	>100K±(3%+0.05Ω)	>100K±(3%+0.05Ω)	>100K±(3%+0.05Ω)
Shock and Vibration	±0.2%	±0.2%	±0.2%
Resistance to Soldering Heat	±0.5%	±0.5%	±0.5%
Terminal Strength	±0.5%	±0.5%	±0.5%
Dielectric Withstand Voltage	300 volts RMS min.	500 volts RMS min.	700 volts RMS min.
Maximum Pulse Voltage	400V	600V	700V
Insulation Resistance	10,000 meg min.	10,000 meg min.	10,000 meg min.
Voltage Coefficient	-10 ppm/Vmax.	-10 ppm/Vmax.	-10 ppm/Vmax.
Short Time Overload	±0.75%	±0.75%	±0.75%

DIMENSIONS (Inches and (mm)):



Dimension	CF 1/8	CF 1/4	CF 1/2
A	1.10±.08 (28.0±2.0)	1.10±.08 (28.0±2.0)	1.10±.08 (28.0±2.0)
B	0.13 + .01/-.00 (3.2+0.2/-0.0)	0.24±.01 (6.0±0.3)	0.33±.02 (8.5±0.5)
C	0.018±.001 (0.45±0.02)	0.022±.001 (0.55±0.03)	0.026±.002 (0.65±0.05)
D	0.07±.01(1.8±0.15)	0.09±.01(2.3±0.2)	0.11±.01(2.8±0.3)

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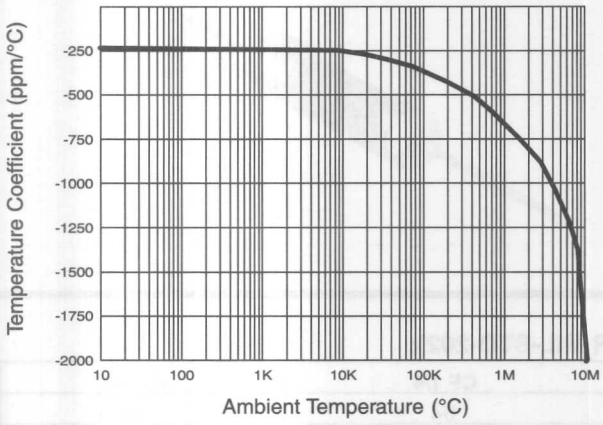
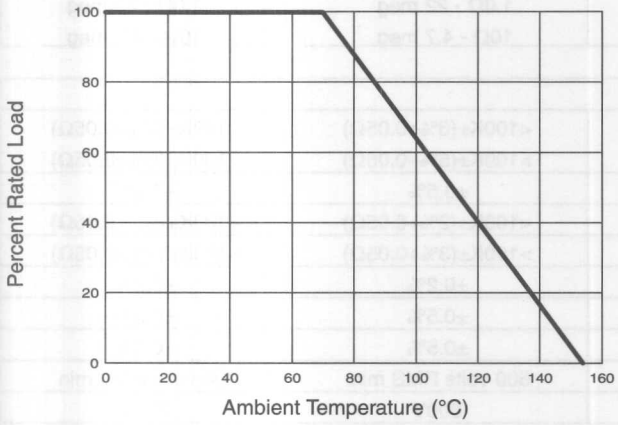
CF PERFORMANCE CURVES:

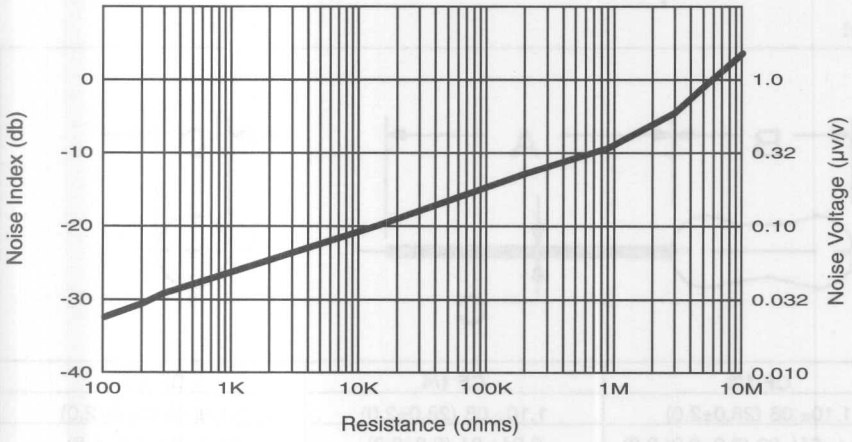
Temperature Coefficient (Typical)



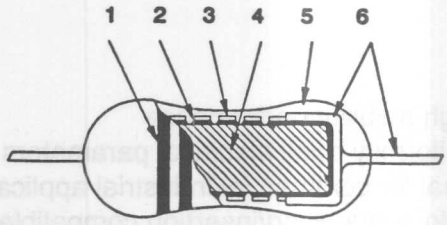
Derating Curve (Typical)



Current Noise (Typical)



CF CONSTRUCTION:



1. COLOR BANDS.
The resistors are permanently color banded for resistance value and tolerance in accordance with EIA specifications.

2. HELIXING.
The units are helixed to a predetermined base to final value ratio to obtain the best TCR, noise and stability characteristics.

3. FILM.
Carbon-film resistors have a homogeneous film of pure carbon deposited by a pyrolitic process at carefully controlled temperatures.

4. SUBSTRATES.
The substrates are of a proprietary non alkaline ceramic, prepared and processed under exacting conditions to guarantee the utmost in uniformity and surface characteristics.

5. INSULATION.
The resistors are coated with multiple layers of a baked-on fire-retardant synthetic resin which provides the units with a high degree of mechanical and electrical protection in the most adverse operating conditions.

6. TERMINATIONS.
Positive contact is provided to the resistance element by precision-made end caps. The lead wires are attached by using proprietary welding techniques.

HOW TO ORDER:

Sample Part No.:

CF-1/4 102 J

IRC Type — CF

Size — 1/4

Resistance Value — 102
2 digit range and 1 digit multiplier

Tolerance — J
G = 2%, J = 5%

Packaging
Bulk or Tape and Reel

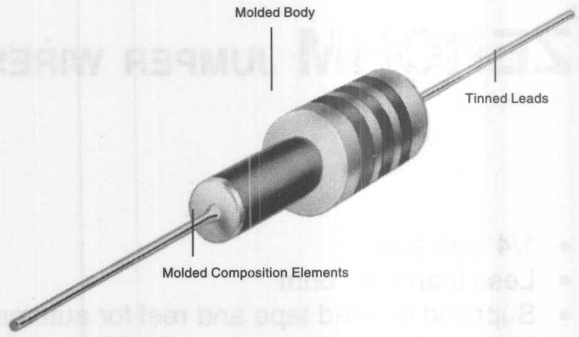
WIREWOUND AND FILM TECHNOLOGIES DIVISION
736 Greenway Road • Boone, North Carolina 28607-1860 • Tel: 828-264-8861 • Fax: 828-264-8866 • www.irctt.com

CARBON COMPOSITION RESISTOR

ISO-9001 Registered

IRC

IBT SERIES



- Meets performance standards of EIA RS-172
- Hot molded process for product uniformity
- Ideal for pulse-load handling

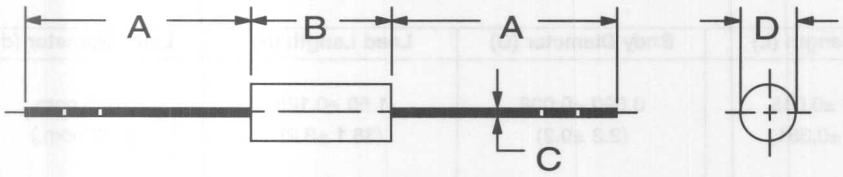
PERFORMANCE CHARACTERISTICS (TESTED PER MIL-STD-202):

ELECTRICAL		IBT 1/4	IBT 1/2
POWER RATING **Determined by load life test 100% load at 70°C ambient**		1/4W	1/2W
RATED CONTINUOUS WORKING VOLTAGE (RCWV)		√PxR or 250 volts whichever is less	√PxR or 350 volts whichever is less
MAXIMUM AMBIENT TEMPERATURE **Resistors derated to zero load at this temperature**		± 130°C	± 130°C
NOMINAL RESISTANCE RANGE		1Ω - 5.6 megΩ	1Ω-20 megΩ
Standard Resistance Tolerances		±5%, ±10%	±5%, ±10%
DIELECTRIC WITHSTAND VOLTAGE **Atmospheric Pressure** **Barometric pressure 3.4" Hg 115 millibars**		 500V 325V	 700V 450V
INSULATION RESISTANCE	**(min.)**	10,000 meg	10,000 meg
VOLTAGE COEFFICIENT OF RESISTANCE **% resistance change/volt at 10% and** **100% RCWV for values 1K to 20meg**	 **(min)** **(max.)**	 -.005% -.032%	 -.005% -.032%
SHORT-TIME OVERLOAD **Apply 2.5 times RCWV at maximum** **Indicated for 5 seconds**	**Maximum voltage** **Typical resistance change** **Maximum resistance change**	700V ±0.5% ±2%	700V ±0.5% ±2%

RESISTANCE TEMPERATURE CHARACTERISTICS:

	Resistance Range	-55°C	-105°C
Maximum percent resistance change from room temperature (+25°C) value	under 1K	+2.0 to +5.0	-4.0 to -2.0
	1K to 9.1K	+5.0 to +9.0	-5.0 to -3.0
	10K to 91K	+8.0 to +11.0	-7.0 to -5.0
	100K to 910K	+10.0 to + 14.0	-9.0 to -7.0
	1 meg to 10 meg	13.0 to + 20.0	-14.0 to -9.0

DIMENSIONS (Inches and (mm)):

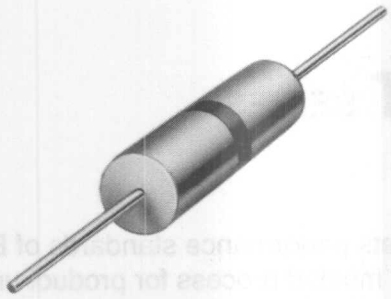


PACKAGING:
5000/reel
1000/bulk

IRC Type	A	B	C	D
IBT 1/4	1.102±0.032 (28.00±0.80)	0.248±0.028 (6.3±0.70)	0.024±0.002 (0.60±0.05)	0.094±0.004 (2.40±0.10)
IBT 1/2	1.024±0.032 (26.00±0.80)	0.374+0.032/-0.028 (9.50+0.80/-0.70)	0.0275±0.002 (0.70±0.05)	0.142±0.008 (3.6±0.20)

ISO-9001 Registered

ZEROHM JUMPER WIRES



- 1/4 watt size
- Less than 0.01 ohm
- Supplied on lead tape and reel for automatic insertion
- MIL version available under DESC dwg 87009

SPECIFICATIONS:

Maximum Resistance:
0.01 ohm

Lead Material:
Molded 1/4W has solder coated copper clad steel.

Body Material:
Electrical grade, high performance, coating and molding compounds.

Minimum Insulation Resistance:
Dry, 10,000 megohm; Wet, 100 megohm

Minimum Dielectric Withstanding Voltage:
Atmospheric, 500V RMS; Reduced, 325V RMS

Current Rating:
15 amps at 70°C for 1/4W max
3A continuous

PACKAGING: 5000/reel & 1000/bulk

APPLICATIONS:

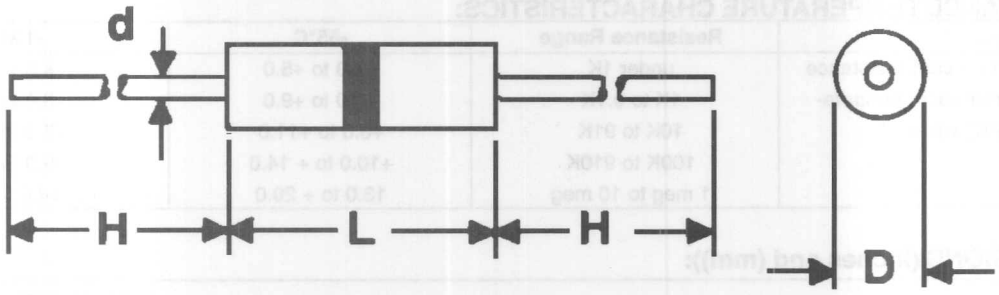
Jumper wire or crossovers, as they are sometimes called, are basically interconnection devices between points on a PC board.

Generally they are used for the following reasons:

- Inability to connect two points on a PC board due to other circuit paths which must be crossed over.
- An after-the-fact design change that requires new point connections.
- Circuit tuning by changing point connections.

IRC's jumper wires offer a quick, simple solution to these problems. They are especially suited for automatic machine insertion on lead tape, and are available in all packing styles including pre-cut and formed leads for manual insertion.

DIMENSIONS(Inches and (mm)):



UNIT	Body Length (L)	Body Diameter (D)	Lead Length (H)	Lead Diameter (d)
Molded 1/4 W	0.250 ±0.015 (6.35 ±0.381)	0.090 ±0.008 (2.3 ±0.2)	1.50 ±0.125 (38.1 ±3.2)	0.025 nom. (0.63 nom.)

All parts marked with black band

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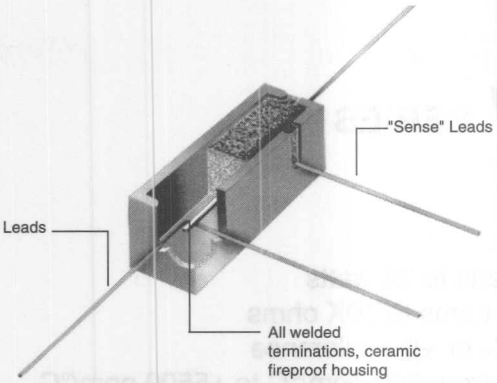
FOUR-TERMINAL CURRENT-SENSING WIREWOUND RESISTOR

ISO-9001 Registered

4LPW SERIES



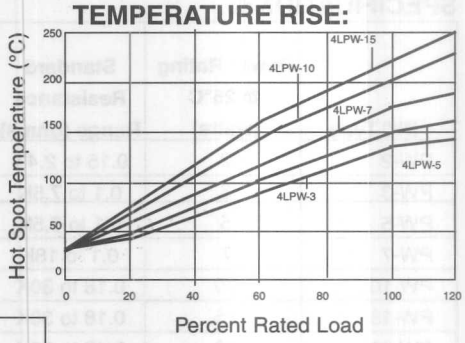
- 3 watts to 15 watts
- ±1%, ±2, ±3, ±5, ±10% tolerance
- 0.005 ohm to 1.0 ohm
- TC = ±40 ppm/°C

SPECIFICATIONS:

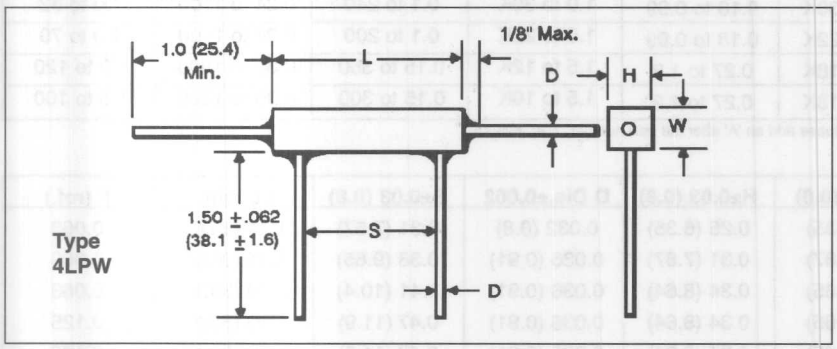
IRC Type	Power @ 25°C (watts)	Max. Current (amps)	Resistance Range (ohms)
4LPW-3	3	10	.005 to 1.0
4LPW-5	5	10	.005 to 1.0
4LPW-7	7	20	.01 to 1.0
4LPW-10	10	20	.01 to 1.0
4LPW-15	15	20	.01 to 1.0

Please note: When ordering the alternate configuration please add an 'A' after the part number. (4LPW-3A)

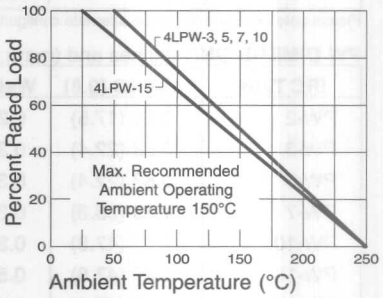
TEMPERATURE RISE:



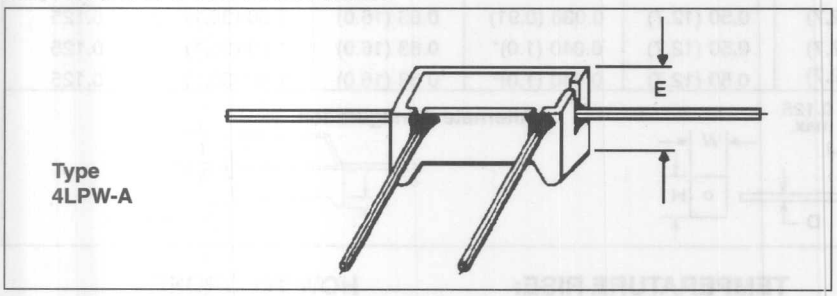
STANDARD CONFIGURATION:



POWER DERATING:



ALTERNATE CONFIGURATION:



HOW TO ORDER:

Sample Part No.:

4LPW 15 0.01Ω 1%

IRC Type

Power
15=15W
(see specification chart for other power ratings)

Resistance Range
Expressed in ohms
(Standard EIA/MIL values)

Tolerance
±1%, ±2%, ±3%, ±5%, ±10% standard

DIMENSIONS (Inches and (mm)):

IRC Type	L ±.063 (1.6)	W ±.03 (.8)	H ±.03 (.8)	S ±.062 (1.6)	D Diameter	E ±.03 (.8)
4LPW-3	.88 (22.4)	.31 (7.87)	.31 (7.87)	.563 (14.3)	.036* (.9)	.38 (9.65)
4LPW-5	.88 (22.4)	.38 (9.65)	.35 (8.89)	.563 (14.3)	.036* (.9)	.41 (10.4)
4LPW-7	1.39 (35.3)	.38 (9.65)	.35 (8.89)	1.013 (25.7)	.036* (.9)	.47 (11.9)
4LPW-10	1.88 (47.8)	.38 (9.65)	.35 (8.89)	1.388 (35.3)	.036* (.9)	.47 (11.9)
4LPW-15	1.88 (47.8)	.50 (12.7)	.50 (12.7)	1.388 (35.3)	.036* (.9)	.63 (16.0)

*For resistances above .05 ohms, diameter D is .032 in. (.8mm)

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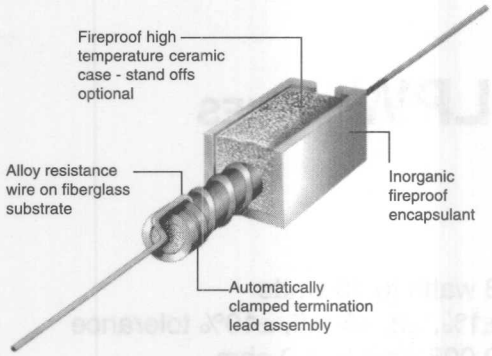
GENERAL PURPOSE AXIAL LEADED POWER WIREWOUND RESISTOR

ISO-9001 Registered

IRC

PW SERIES



- 2 watts to 25 watts
- 0.10 ohms to 30K ohms
- ±10% or ±5% tolerance
- TC's from 300 ppm/°C to +5500 ppm/°C

SPECIFICATIONS:

IRC Type	Power Rating @ 25°C (watts)	Standard Resistance Range (ohms)	Standard Temperature Coefficient 0.06%/°C over R range	Standard Temperature Coefficient 0.03%/°C over R range	Special Temperature Coefficients +0.55%/°C over R range	Special Temperature Coefficients +0.45%/°C over R range	Special Temperature Coefficients +0.25%/°C over R range
PW-2	2	0.15 to 2.4K	0.15 to 0.99	1.0 to 2.4K	0.1 to 30	0.24 to 130	1.0 to 10
PW-3	3	0.1 to 7.5K	0.1 to 0.99	1.0 to 7.5K1.0	0.1 to 86	0.1 to 270	0.24 to 20
PW-5	5	0.1 to 8.5K	0.1 to 0.99	to 8.5K	0.1 to 68	0.1 to 300	0.27 to 22
PW-7	7	0.1 to 18K	0.1 to 0.99	1.0 to 18K	0.1 to 150	0.15 to 680	1.0 to 51
PW-10	10	0.18 to 30K	0.18 to 0.99	1.0 to 30K	0.1 to 240	0.24 to 1100	1.0 to 82
PW-15	15	0.18 to 30K	0.18 to 0.99	1.0 to 30K	0.1 to 240	0.24 to 1100	1.0 to 82
PW-18	18	0.18 to 22K	0.18 to 0.99	1.0 to 22K	0.1 to 200	0.24 to 1100	1.0 to 70
PW-22	22	0.27 to 18K	0.27 to 1.3	1.5 to 12K	0.15 to 360	0.36 to 1800	1.0 to 120
PW-25	25	0.27 to 18K	0.27 to 1.3	1.5 to 10K	0.15 to 300	0.36 to 1200	1.5 to 100

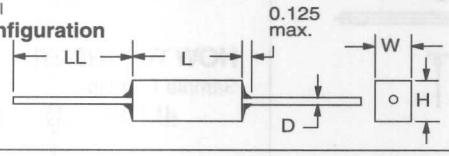
Please note: When ordering the alternate configuration please add an 'A' after the part number. (i.e., PW-2A)

PW DIMENSIONS (Inches and (mm)):

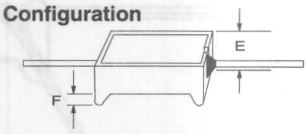
IRC Type	L±0.03 (0.8)	W±0.03 (0.8)	H±0.03 (0.8)	D Dia.±0.002	E±0.03 (0.8)	LL min.	F (ref.)
PW-2	0.69 (17.5)	0.25 (6.35)	0.25 (6.35)	0.032 (0.8)	0.31 (7.87)	1.44 (36.6)	0.063
PW-3	0.88 (22.4)	0.31 (7.87)	0.31 (7.87)	0.036 (0.91)	0.38 (9.65)	1.44 (36.6)	0.063
PW-5	0.88 (22.4)	0.38 (9.65)	0.34 (8.64)	0.036 (0.91)	0.41 (10.4)	1.50 (38.1)	0.063
PW-7	1.39 (35.3)	0.38 (9.65)	0.34 (8.64)	0.036 (0.91)	0.47 (11.9)	1.50 (38.1)	0.125
PW-10	1.88 (47.8)	0.38 (9.65)	0.34 (8.64)	0.036 (0.91)	0.47 (11.9)	1.50 (38.1)	0.125
PW-15	1.88 (47.8)	0.50 (12.7)	0.50 (12.7)	0.036 (0.91)	0.63 (16.0)	1.50 (38.1)	0.125
PW-18	1.88 (47.8)	0.50 (12.7)	0.50 (12.7)	0.036 (0.91)	0.63 (16.0)	1.50 (38.1)	0.125
PW-22	2.50 (63.5)	0.50 (12.7)	0.50 (12.7)	0.040 (1.0)*	0.63 (16.0)	1.50 (38.1)	0.125
PW-25	2.50 (63.5)	0.50 (12.7)	0.50 (12.7)	0.040 (1.0)*	0.63 (16.0)	1.50 (38.1)	0.125

*Copper Clad Steel

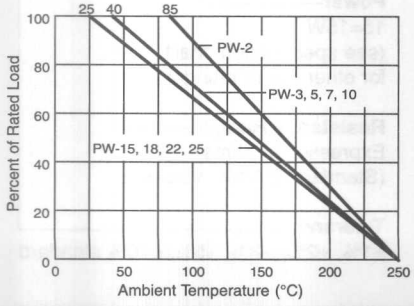
Standard Configuration



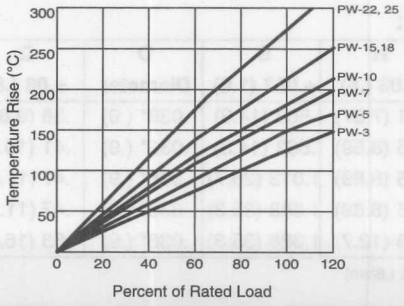
Alternate Configuration



POWER DERATING:



TEMPERATURE RISE:



HOW TO ORDER:

Sample Part No.:

PW 18 12K 10%

IRC Type

Power
18 = 18watts

Resistance Value
(standard EIA values)

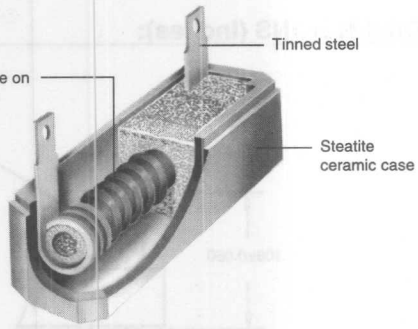
Tolerance
±10 or ±5% standard

WIREWOUND AND FILM TECHNOLOGIES DIVISION
736 Greenway Road • Boone, North Carolina 28607-1860 • Tel: 828-264-8861 • Fax: 828-264-8866 • www.irctt.com

GENERAL PURPOSE RADIAL TERMINAL POWER WIREWOUND RESISTOR

ISO-9001 Registered

PW SERIES



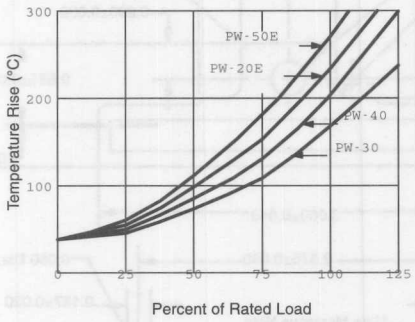
- 20 watts to 50 watts
- 0.10 ohms to 2.0K ohms
- ±10% or ±5% tolerance
- Custom parts available - consult factory

SPECIFICATIONS:

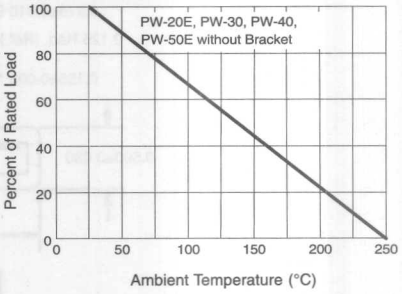
IRC Type	Power at 25°C (watts)	Resistance Range (ohms)
PW-20E	20	0.1 - 2.0K
PW-30	30	0.5 - 1.2K
PW-40	40	0.65 - 1.5K
PW-50E	50	0.08 - 1.8K

- Flameproof inorganic construction
- EIA RS-344, Insulated fixed wirewound resistors
- 1000 hour load life at 25°C: 5% max.
- Moisture no load 240 hours: 2% max.
- Temperature cycling (5 cyc.): 5% max.

TEMPERATURE RISE at 25°C:
(without bracket)



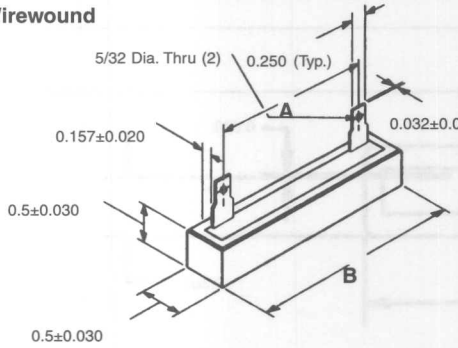
POWER DERATING:



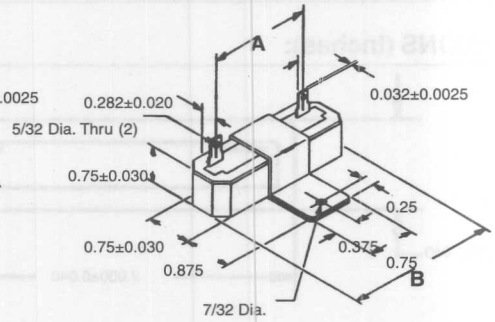
With Bracket:
PW-30 Increased to 40 watts
PW-40 Increased to 50 watts
PW-50 Increased to 60 watts

DIMENSIONS (Inches):

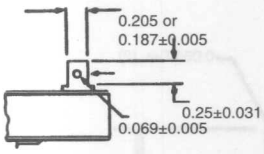
PW-20E Wirewound

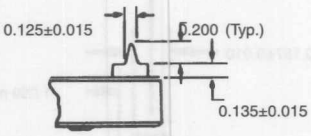


PW-30, 40 and 50E Wirewound



PW-20E Alternate Terminal Configuration - 0.020" Tin coated Steel





Printed Circuit Terminal

IRC Type	A (±0.030)	B (±0.060)
PW-20E	1.875	2.50
PW-30	2.00	2.55
PW-40	2.45	3.00
PW-50E	3.075	3.625

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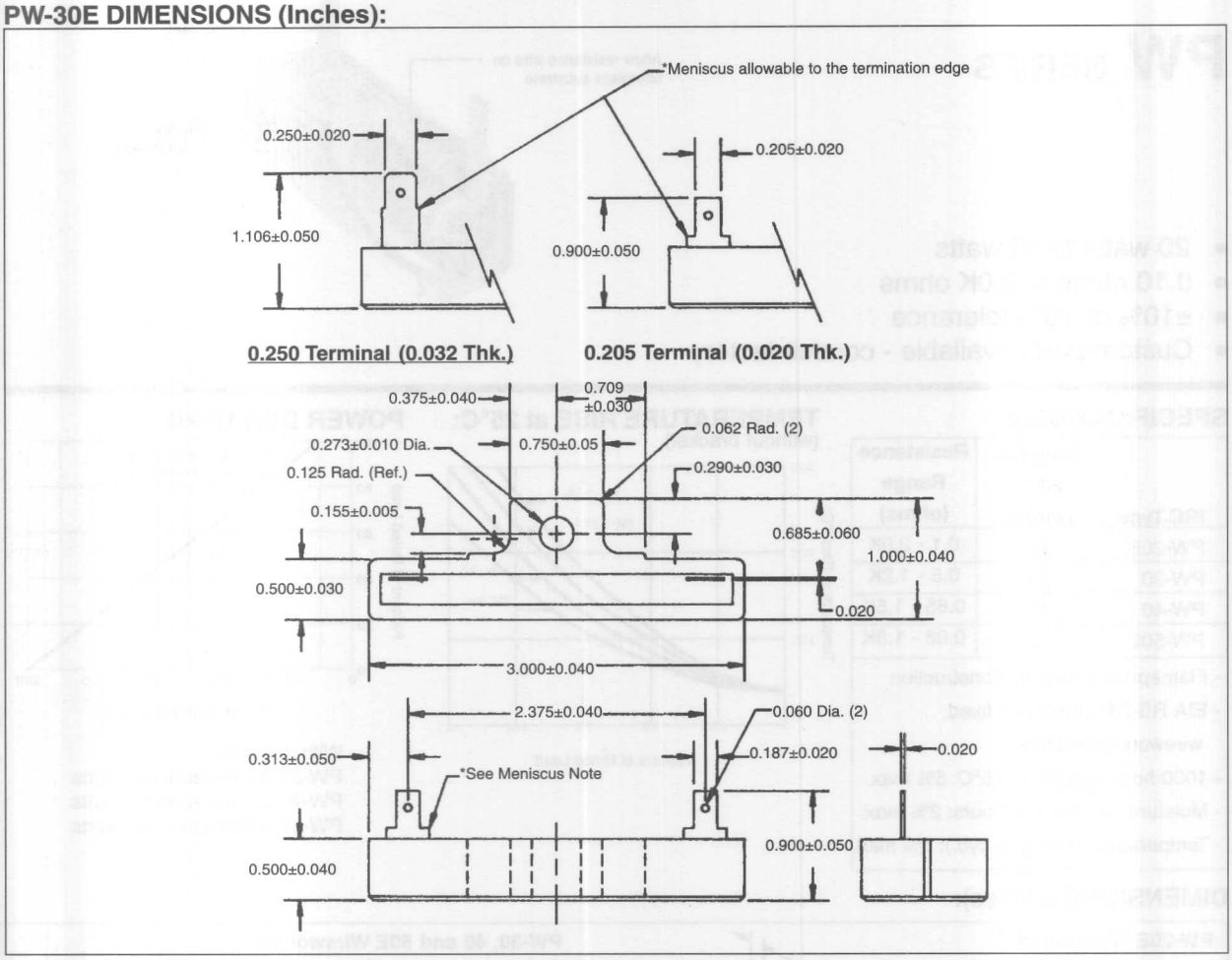
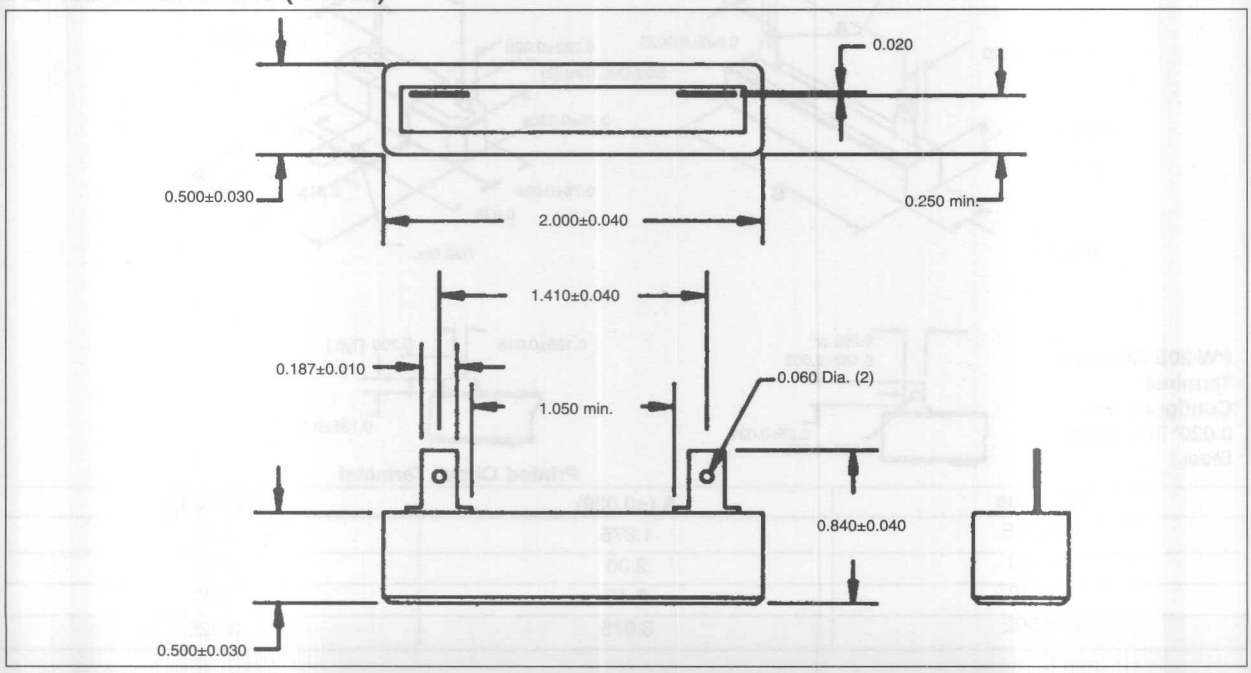
ISO-9001 Registered

Special PW Power Wireounds

PW-30E DIMENSIONS (Inches):



PW-15E DIMENSIONS (Inches):



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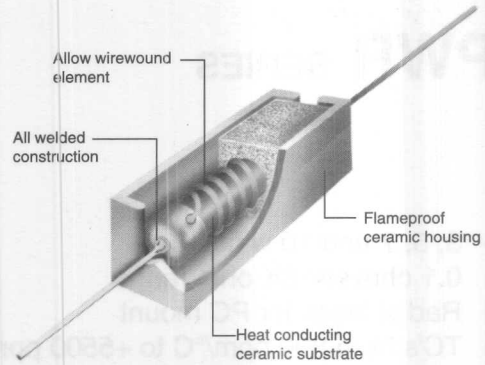
SEMI-PRECISION POWER WIREWOUND RESISTOR FOR PULSE & SURGE APPLICATIONS

ISO-9001 Registered

IRC

PPW SERIES



- 2 watts to 15 watts
- 0.10 ohms to 5000 ohms
- ±3%, ±2%, or ±1% tolerance
- ±20 ppm/°C TCR

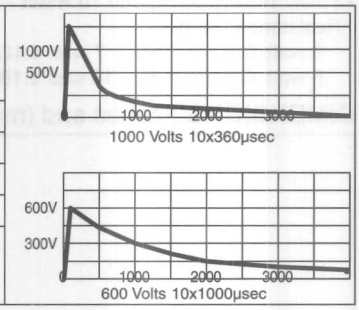
SPECIFICATIONS:

IRC Type	Power at 25°C (watts)	Resistance Range (ohms)
PPW-2	2	0.1 to 1600
PPW-3	3	0.1 to 1600
PPW-5	5	0.1 to 1600
PPW-7	7	0.1 to 2500
PPW-10	10	0.1 to 5000
PPW-15	15	0.1 to 5000

LIGHTING SURGE CAPABILITIES FOR PPW-2:

Resistive Range	10 x 1000*	10 X 360*
1 to 9.9Ω	250V	650V
10 to 29.9Ω	500V	850V
30 to 99Ω	600V	1000V
100 to 1600Ω	1000V	1500V

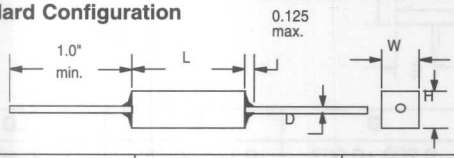
*10 microseconds - Maximum rise time to peak voltage. 360 or 1000 microseconds - minimum decay time to one half peak.



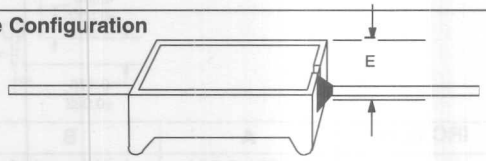
Please note: When ordering the alternate configuration please add an 'A' after the part number. (i.e., PPW-3A)

DIMENSIONS (Inches and (mm)):

Standard Configuration

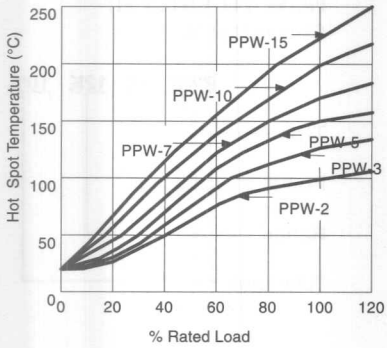


Alternate Configuration

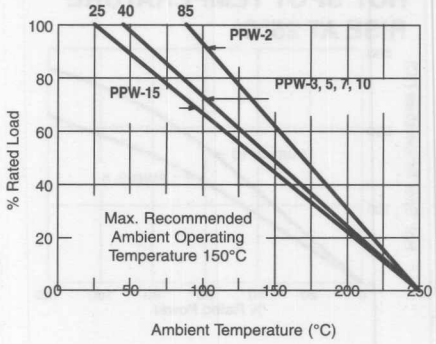


IRC Type	L ±0.03 (0.8)	W ±0.03 (0.8)	H ±0.03 (0.8)	D Diameter	E ±0.03 (0.8)
PPW-2	0.69 (17.05)	0.275 (6.99)	0.275 (6.99)	0.032 (0.8)	0.32 (8.134)
PPW-3	0.88 (22.3)	0.310 (7.87)	0.310 (7.87)	0.032 (0.8)	0.38 (9.65)
PPW-5	0.88 (22.3)	0.380 (9.65)	0.350 (8.89)	0.032 (0.8)	0.41 (10.4)
PPW-7	1.39 (35.3)	0.380 (9.65)	0.350 (8.89)	0.032 (0.8)	0.47 (11.9)
PPW-10	1.88 (47.7)	0.380 (9.65)	0.350 (8.89)	0.032 (0.8)	0.47 (11.9)
PPW-15	1.88 (47.7)	0.500 (12.7)	0.500 (12.7)	0.032 (0.8)	0.50 (12.7)

TEMPERATURE RISE:



POWER DERATING:



HOW TO ORDER:

Sample Part No.:

PPW 10 15Ω 2%

Type

Power
10 = 10 watts
(See specification chart for other power ratings)

Resistance Value
Expressed in ohms
(Std. EIA/MIL Values)

Tolerance
±3%, ±2%, ±1% std.

WIREWOUND AND FILM TECHNOLOGIES DIVISION
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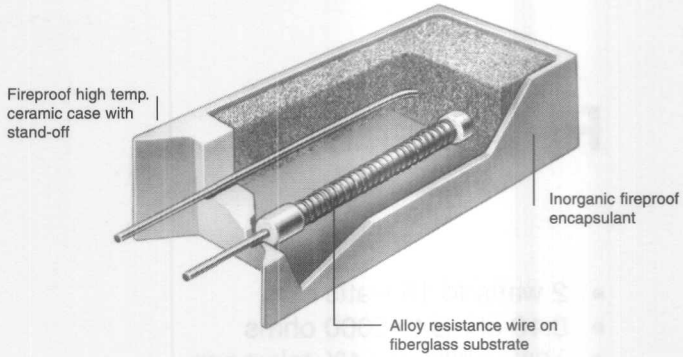
GENERAL PURPOSE STAND-UP POWER WIREWOUND RESISTOR

ISO-9001 Registered

IRC

PWR SERIES

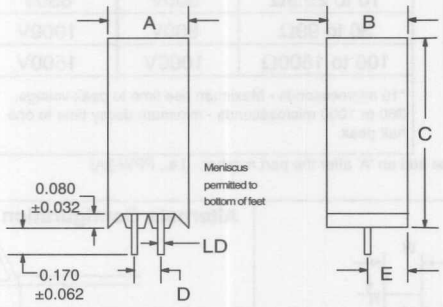


- 3, 5, 7 and 10 watts
- 0.1 ohm to 18K ohm range
- Radial leads for PC mount
- TC's from 300 ppm/°C to +5500 ppm/°C

SPECIFICATIONS:

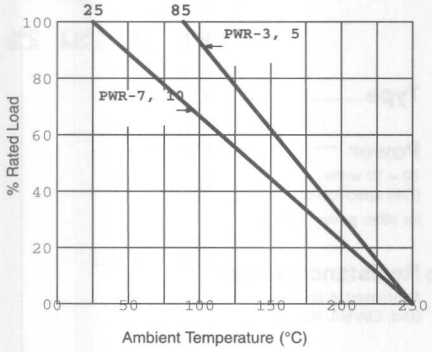
- Power Rating: 3,5,7, and 10 watts
- Resistance Range:
  3 watt: 0.1Ω to 7.5K 7 watt 0.1Ω to 18K
  5 watt: 0.1Ω to 8.5K 10 watt 0.18Ω to 18K
- Tolerance: ±5% and ±10% (refer to PWRG for tolerances less than 5% pg. 129)
- Flameproof inorganic construction
- EIA RS-344, insulated fixed wirewound resistors

DIMENSIONS (Inches and (mm)):

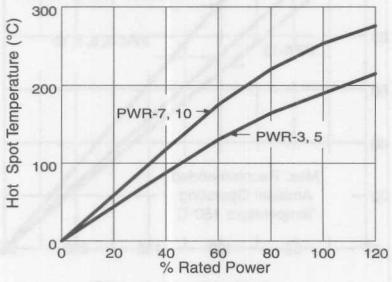


IRC Type	A	B	C	D	E	LD
PWR-3	0.475 ±0.030 (12.0 ±0.8)	0.320 ±0.030 (8.1 ±0.8)	1.00 ±0.030 (25.4 ±0.8)	0.200 ±0.062 (5.08 ±1.6)	0.175 ±0.062 (4.44 ±1.6)	0.036 ±0.002 (0.91 ±0.05)
PWR-5	0.500 ±0.030 (12.7 ±0.8)	0.350 ±0.030 (8.8 ±0.8)	1.00 ±0.030 (25.4 ±0.8)	0.200 ±0.062 (5.08 ±1.6)	0.175 ±0.062 (4.44 ±1.6)	0.036 ±0.002 (0.91 ±0.05)
PWR-7	0.500 ±0.030 (12.7 ±0.8)	0.350 ±0.030 (8.8 ±0.8)	1.50 ±0.032 (38.1 ±0.81)	0.200 ±0.062 (5.08 ±1.6)	0.175 ±0.062 (4.44 ±1.6)	0.036 ±0.002 (0.91 ±0.05)
PWR-10	0.630 ±0.032 (16.0 ±0.81)	0.510 ±0.032 (13.2 ±0.81)	1.39 ±0.032 (35.3 ±0.81)	0.290 ±0.062 (7.4 ±1.6)	0.250 ±0.062 (6.4 ±1.6)	0.036 ±0.002 (0.91 ±0.05)

POWER DERATING:



HOT SPOT TEMPERATURE RISE AT 25°C



HOW TO ORDER:

Sample Part No.:

PWR 10 12K 10%

Type
Power
Range
Tolerance

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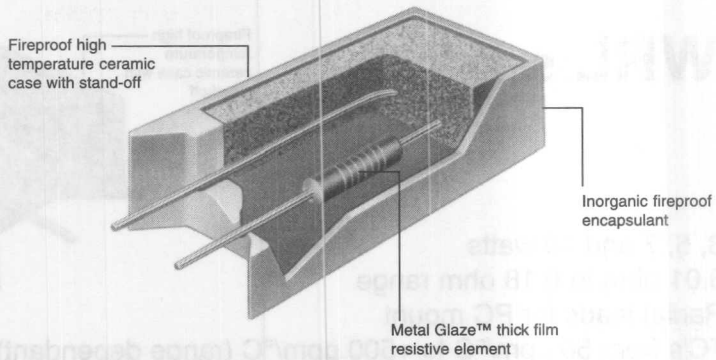
GENERAL PURPOSE POWER METAL GLAZE RESISTOR

ISO-9001 Registered

PWRG SERIES

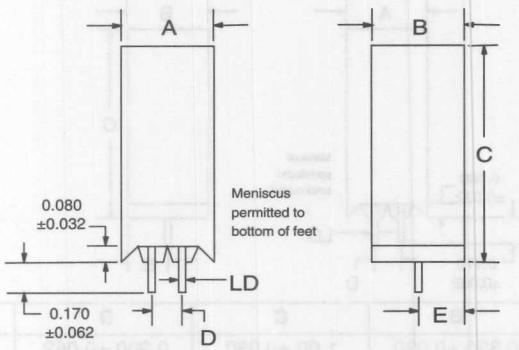


- 3 and 5 watts
- 1 ohm to 1 Megohm range
- Radial leads for PC mount
- TCR from ±100 ppm/°C

SPECIFICATIONS:

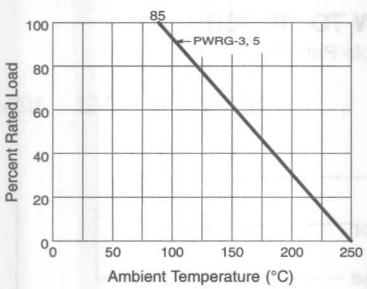
- Power Rating: 3 and 5 watts
- Resistance Range: 1Ω to 1 MΩ
- Tolerance: ±1%, ±2%, ±5%, and ±10%
- Flameproof inorganic construction

DIMENSIONS (Inches and (mm)):

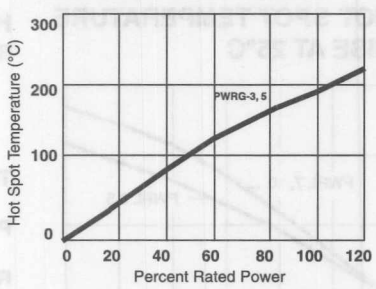


IRC Type	A	B	C	D	E	LD
PWRG-3	0.475 ±0.030 (12.0 ±0.8)	0.320 ±0.30 (8.1 ±0.8)	1.00 ±0.030 (25.4 ±0.8)	0.200 ±0.062 (5.8 ±1.6)	0.175 ±0.062 (4.44 ±1.6)	0.032 ±0.002 (0.81 ±0.05)
PWRG-5	0.500 ±0.030 (12.7 ±0.8)	0.350 ±0.030 (8.9 ±0.8)	1.00 ±0.030 (25.4 ±0.8)	0.200 ±0.062 (5.08 ±1.6)	0.175 ±0.062 (0.44 ±1.6)	0.032 ±0.002 (0.81 ±0.05)

POWER DERATING:

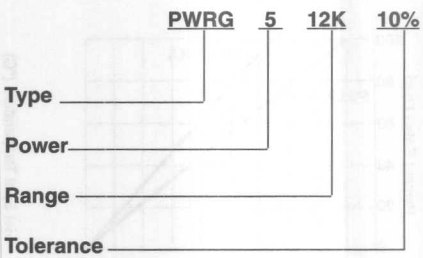


HOT SPOT TEMP. RISE:



HOW TO ORDER:

Sample Part No.:



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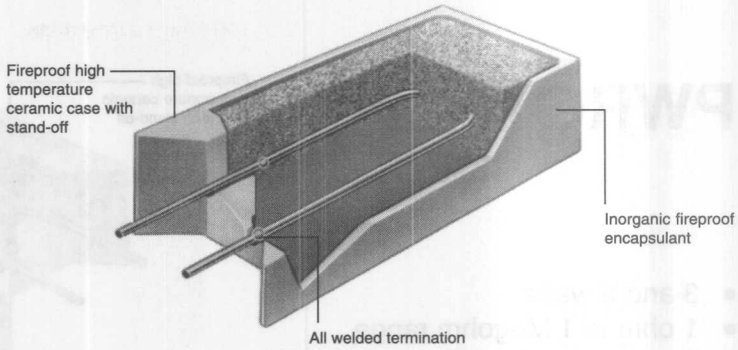
LOW RESISTANCE STAND-UP POWER WIREWOUND RESISTOR

ISO-9001 Registered

PWRL SERIES

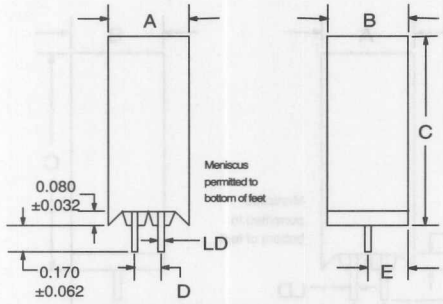


- 3, 5, 7 and 10 watts
- 0.01 ohm to 0.18 ohm range
- Radial leads for PC mount
- TC's from 50 ppm/°C to +500 ppm/°C (range dependant)

SPECIFICATIONS:

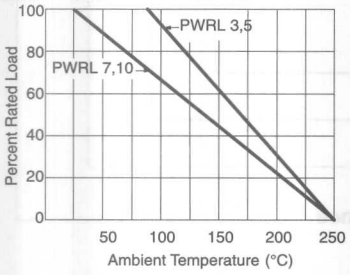
- Power Rating: 3, 5, 7 and 10 watts
- Resistance Range: 0.01Ω to 0.18Ω
- Tolerance: ±1%, ±2%, ±3%, ±5%, and ±10%
- Flameproof inorganic construction
- EIA RS-344, insulated fixed wirewound resistors

DIMENSIONS (Inches and (mm)):

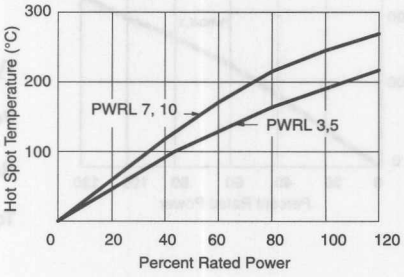


IRC Type	A	B	C	D	E	LD
PWRL-3	0.475 ±0.030 (12.0 ±0.8)	0.320 ±0.030 (8.1 ±0.8)	1.00 ±0.030 (25.4 ±0.8)	0.200 ±0.062 (5.08 ±1.6)	0.175 ±0.062 (4.44 ±1.6)	0.040 ±0.002 (1.02 ±0.05)
PWRL-5	0.500 ±0.030 (12.7 ±0.8)	0.350 ±0.030 (8.8 ±0.8)	1.00 ±0.030 (25.4 ±0.8)	0.200 ±0.062 (5.08 ±1.6)	0.175 ±0.062 (4.44 ±1.6)	0.040 ±0.002 (1.02 ±0.05)
PWRL-7	0.500 ±0.030 (12.7 ±0.8)	0.350 ±0.030 (8.8 ±0.8)	1.50 ±0.032 (38.1 ±0.81)	0.200 ±0.062 (5.08 ±1.6)	0.175 ±0.062 (4.44 ±1.6)	0.040 ±0.002 (1.02 ±0.05)
PWRL-10	0.630 ±0.032 (16.0 ±0.81)	0.510 ±0.032 (13.2 ±0.81)	1.39 ±0.032 (35.3 ±0.81)	0.290 ±0.062 (7.4 ±1.6)	0.250 ±0.062 (6.4 ±1.6)	0.040 ±0.002 (1.02 ±0.05)

POWER DERATING:

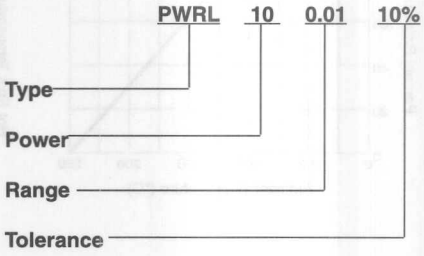


HOT SPOT TEMPERATURE RISE AT 25°C



HOW TO ORDER:

Sample Part No.:



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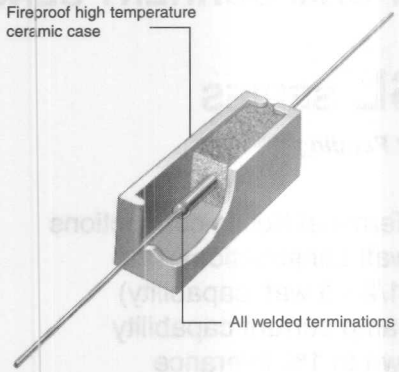
EXTREMELY LOW RESISTANCE POWER WIREWOUNDS

ISO-9001 Registered

PLO SERIES



- 3 watts to 15 watts
- ±1%, ±2, ±3, ±5, ±10% tolerance
- 0.005 ohm to 0.18 ohm
- TC's from 30 ppm/°C to +500 ppm/°C (range dependant)

SPECIFICATIONS:

IRC Type	Power @ 25°C (watts)	Resistance Range (ohms)
PLO-3	3	.005 to .18
PLO-5	5	.005 to .18
PLO-7	7	.01 to .18
PLO-10	10	.01 to .18
PLO-15	15	.01 to .18

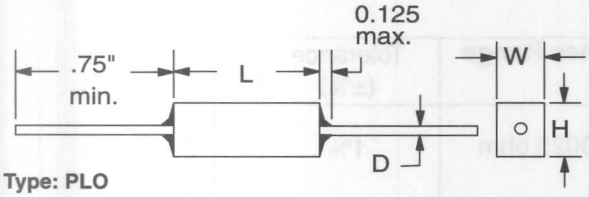
Please note: When ordering the alternate configuration please add an 'A' after the part number. (i.e., PLO-3A)

-Inductance less than 10 nanohenries

NOTE: Standard test points for PLO-3 and PLO-5 are 1.75 in. (44.45mm); test points for PLO-7, PLO-10, PLO-15 are 2.500 in (63.50mm). Consult factory for application.

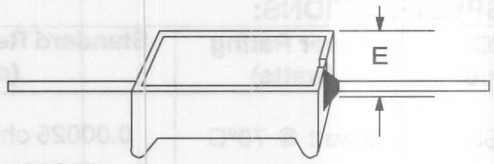
DIMENSIONS (Inches and (mm)):

Standard Configuration



Type: PLO

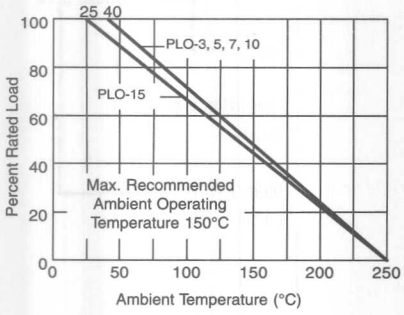
Alternate Configuration



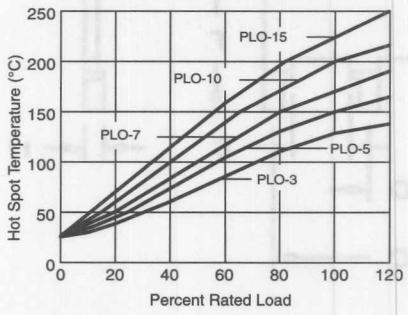
Type: PLO-XA

IRC Type	L ±.063 (1.6)	W ±.03 (.8)	H ±.03 (.8)	D - Diameter ±.002 (.05)	E ±.03 (.8)
PLO-3	0.88 (22.4)	.31 (7.87)	.31 (7.87)	.040	.38 (9.65)
PLO-5	0.88 (22.4)	.38 (9.65)	.35 (8.89)	.040	.41 (10.4)
PLO-7	1.39 (35.3)	.38 (9.65)	.35 (8.89)	.040	.47 (11.9)
PLO-10	1.88 (47.8)	.38 (9.65)	.35 (8.89)	.040	.47 (11.9)
PLO-15	1.88 (47.8)	.50 (12.7)	.50 (12.7)	.040	.63 (16.0)

POWER DERATING:



TEMPERATURE RISE:



HOW TO ORDER:

Sample Part No.:

PLO 5 .02Ω 3%

IRC Type

Power
5 = 5 watts
(see specification chart for other power ratings)

Resistance Value
Expressed in ohms
(Standard EIA/MIL values)

Tolerance
±1%, ±2%, ±3%, ±5%, ±10% standard

PRELIMINARY

ISO-9001 Registered

FOUR TERMINAL OPEN AIR LOW OHM CURRENT SENSE RESISTOR

CSL SERIES

Patent Pending

- 4-Terminal Kelvin connections
- 5 watt construction
  - (1/2 - 5 watt capability)
- 55 amp current capability
- Down to 1% tolerance
- ±30 ppm/°C TCR

FEATURES:

- Inductance less than 10 nanohenries
- Flameproof
- Solderable leads (60/40 plate)
- 55 amp continuous operating current
- Inline construction for easy board insertion
- Economical board space design
- Welded construction

APPLICATIONS:

- Current Sensing
- Feed Back
- Motor Control
- Surge/Pulse Applications

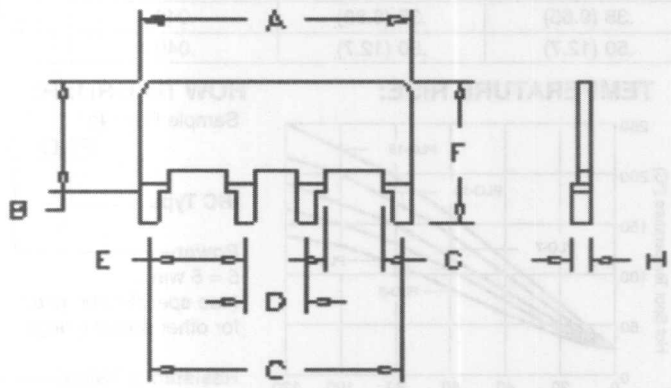
CSL SPECIFICATIONS:

IRC Type	Power Rating (watts)	Standard Resistance Range (ohms)	Tolerance (±%)
CSL	5 watt @ 70°C	0.00025 ohm - 0.0025 ohm	1%

Consult factory for values outside of standard resistance range.

DIMENSIONS Inches (mm):

All Dimensions ±0.010 (0.254)



A	B	C	D	E	F	G	H	Resistor Element Thickness	
0.862 (21.9)	0.426 (10.8)	0.800 (20.3)	0.200 (5.1)	0.300 (7.6)	0.550 (14.0)	0.176 (4.5)	0.062 (1.57)	0.080 max (2.03)	0.010 min. (0.254)

How to Order:
Sample Part No.:

CSL R001 1%

Type — CSL

Resistance Value — R001

Tolerance ±1% — 1%

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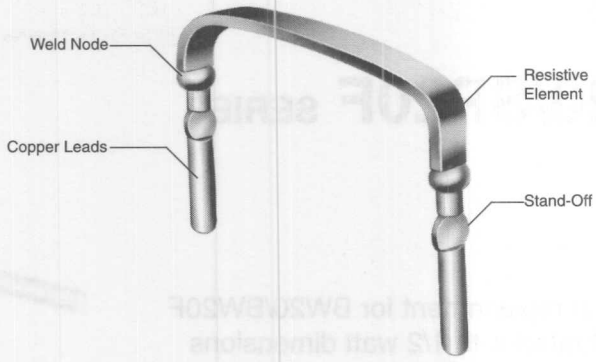
OPEN AIR SENSE RESISTORS

ISO-9001 Registered

OAR SERIES

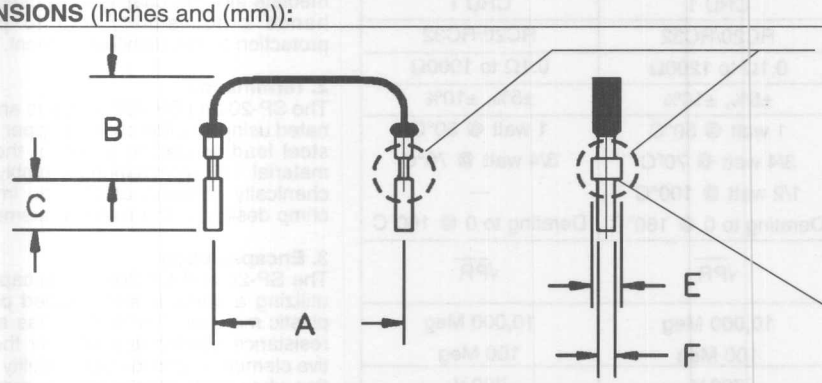


- 1, 3 & 5 watts
- ±1% or ±5% tolerance
- Resistance wire TCR ±20 ppm/°C
- Contact factory for height specifications, application notes and resistance values below 0.005 ohms.

SPECIFICATIONS:

IRC Type	IRC Power Rating (watts)	Available Resistance (ohms)
OAR-1	1W @ 85°C	0.005 ohms to 0.10 ohms
OAR-3	3W @ 85°C	0.005 ohms to 0.10 ohms
OAR-5	5W @ 85°C	0.005 ohms to 0.05 ohms

DIMENSIONS (Inches and (mm)):



On lower ranges stand-off may be eliminated

NOTE:
Contact factory for:
1. Variations of "A" dimension.
2. Different lead diameter.

Test Point (Kelvin connection)

IRC Type	A	B	C	E	F
OAR-1	0.450 +0.040/-0.020 (11.43 +1.020/-0.508)	0.200 ±0.100 (5.08 ±2.54)	0.125 ±0.030 (3.18 ±0.762)	0.065 +0.010/-0.005 (1.65 +0.254/-0.127)	0.040 ±0.002 (1.02 ±0.051)
OAR-3	0.600 +0.040/-0.020 (15.24 +1.020/-0.508)	1.0 max. (25.4 max.)	0.125 ±0.030 (3.18 ±0.762)	0.065 +0.010/-0.005 (1.65 +0.254/-0.127)	0.040 ±0.002 (1.02 ±0.051)
OAR-5	0.800 +0.040/-0.020 (20.32 +1.020/-0.508)	1.0 max. (25.4 max.)	0.125 ±0.030 (3.18 ±0.762)	0.065 +0.010/-0.005 (1.65 +0.254/-0.127)	0.040 ±0.002 (1.02 ±0.051)

FEATURES:

- Welded Construction
- Flameproof
- Inductance less than 10 nanohenries
- Solderable copper leads (60/40)

APPLICATIONS:

- Current Sensing
- Feedback
- Low inductance
- Surge and pulse

OPERATING CHARACTERISTICS:

- Load Life @25°C (1000 hrs): 1% max.
- Moisture No Load (1000 hrs): 1% max.
- Temperature Cycle @ -40°C & +125°C (1000 cyc): 1% max.

HOW TO ORDER:

Sample Part No.:

OAR-1 0.10 5%

- **IRC Type** — OAR-1
- **Power (watts)** — 0.10
- **Resistance Range (ohms)** — 0.10
- **Tolerance** — 5%

*For any AC applications please contact the factory.

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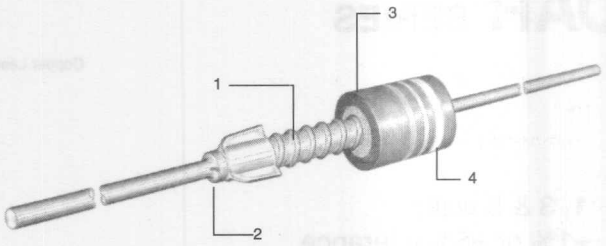
GENERAL-PURPOSE FAILSAFE MOLDED WIREWOUND RESISTOR

ISO-9001 Registered

SP20/SP20F SERIES



(See notes below.)

- Drop-in replacement for BW20/BW20F
- 1 watt rated with 1/2 watt dimensions
- ±5%, ±10% tolerance
- 0.1 ohm to 1200 ohms
- TCR's as low as ±150 ppm/°C standard (custom TC's available)
- Weldable and solderable magnetic leads

SPECIFICATIONS:

IRC Type	SP20	SP20F
EIA RS-344 Style	CRU 1	CRU 1
MIL-R-11 Style	RC20/RC32	RC20/RC32
Resistance - Std.	0.1Ω to 1200Ω	0.1Ω to 1000Ω
Tolerance - Std.	±5%, ±10%	±5%, ±10%
Power Rating	1 watt @ 50°C 3/4 watt @ 70°C 1/2 watt @ 100°C Derating to 0 @ 160°C	1 watt @ 50°C 3/4 watt @ 70°C --- Derating to 0 @ 160°C
Max. Continuous Working Voltage	$\sqrt{PR}$	$\sqrt{PR}$
Min. Insulation Resistance Dry	10,000 Meg	10,000 Meg
Min. Insulation Resistance Wet	100 Meg	100 Meg
Min. Dielectric Withstanding Volts (RMS) ATM	700 V	700 V
Min. Dielectric Withstanding Volts (RMS) Reduced Pressure	450V	450 V
Hotspot Temperature Rise	120°C @ 1 watts	120°C @ 1 watts
Typical Load Life	5%	5%
Current Noise	Negligible	Negligible

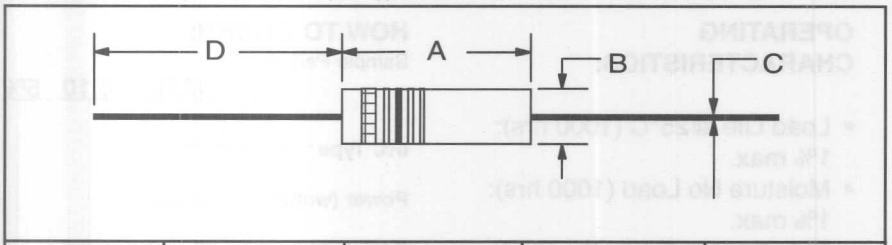
1. Resistive Element
All resistor types have resistance alloy winding on a braided fiberglass substrate. Intermediate silicone coatings are used to enhance processibility and to provide protection to the resistive element.

2. Termination
The SP-20 and SP-20F resistors are terminated using an alloy coated copper flashed steel lead welded to a cap of the same material. This termination assembly is mechanically crimped, utilizing an improved crimp design, to the resistive element.

3. Encapsulation
The SP-20 and SP-20F are encapsulated utilizing a compression molded phenolic plastic material. The SP-20F has a flame-resistance coating applied over the resistive element to provide flammability protection when destructive overloads may occur.

4. Marking
All products are marked utilizing heat and solvent resistant color code bands consistent with EIA/MIL requirements. The first band is double width to designate wirewound construction. A fifth band, blue in color, is used for flameproof identification.

DIMENSIONS (Inches and (mm)):



IRC TYPE	A	B	C	D
SP20	0.390±0.010 (9.91±0.25)	0.140±0.008 (3.56±0.20)	0..032±0.002 (0.813±0.05)	1.50±0.126 (38.1±3.2)
SP20F	0.390±0.010 (9.91±0.25)	0.140±0.008 (3.56±0.20)	0.032±0.002 (0.813±0.05)	1.50±0.126 (38.1±3.2)

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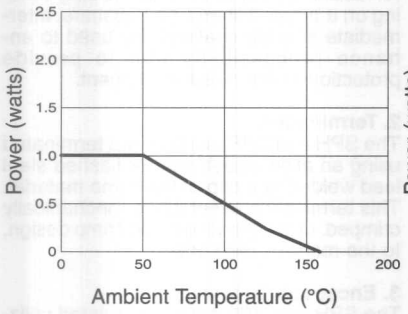
SP20/SP20F CHARACTERISTICS (TYPICAL PERFORMANCE):

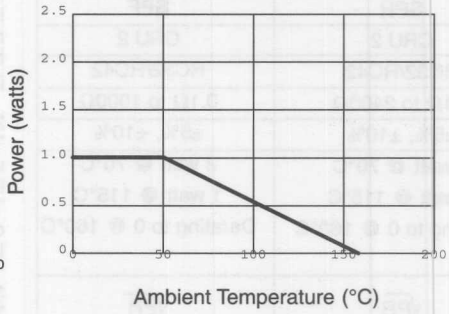
Test	SP20	SP20F
Temperature Coefficient (ppm)	<1R <±800 ≥1R <±150	<1R <±800* ≥1R <±150
Dielectric Withstanding Voltage (RMS)	700V	700V
Momentary Overload	5%	5%
Low Temperature Operation	5%	5%
Temperature Cycle	5%	5%
Humidity	5%	5%
Load Life	5%	5%
Terminal Strength	5%	5%
Resistance to Solder Heat	5%	5%
Solderability	No Failures	No Failures

*0.1 ohm SP20F <1000 ppm.

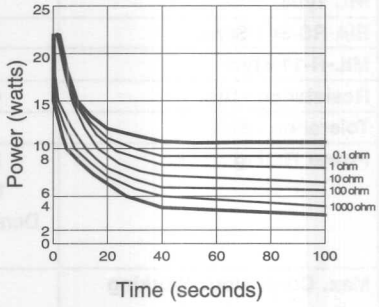
SP-20 POWER DERATING:



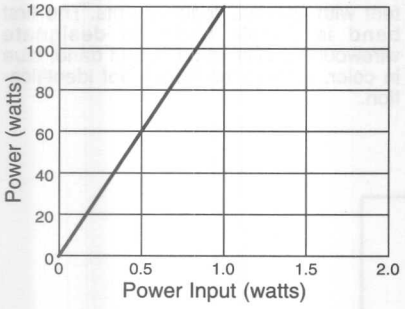
SP-20F POWER DERATING:



SP-20F TYPICAL FUSING:



SP-20 AND SP-20F TEMPERATURE RISE:



HOW TO ORDER:

Sample Part No.:

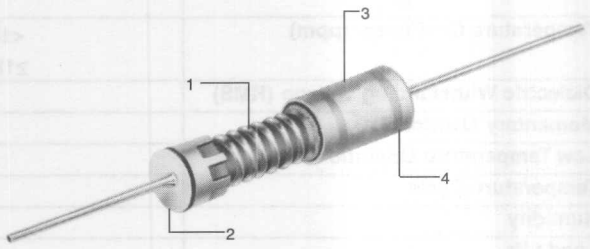
SP-20 150Ω 5%

- IRC Type
- Power
- Resistance Range
- Tolerance

GENERAL-PURPOSE FAILSAFE MOLDED WIREWOUND RESISTOR

ISO-9001 Registered

SPH/SPF SERIES



See notes below

- Drop-in replacement for BWH/BWF
- 2 watt rated with 1 watt dimensions
- ±5%, ±10% tolerance
- 0.1 ohm to 2400 ohms
- TCR's as low as ±150 ppm/°C std (custom TC's available)
- Weldable and solderable leads

SPECIFICATIONS:

IRC Type	SPH	SPF
EIA RS-344 Style	CRU 2	CRU 2
MIL-R-11 Style	RC32/RC42	RC32/RC42
Resistance - Std.	0.1Ω to 2400Ω	0.1Ω to 1000Ω
Tolerance - Std.	±5%, ±10%	±5%, ±10%
Power Rating	2 watt @ 70°C 1 watt @ 115°C Derating to 0 @ 160°C	2 watt @ 70°C 1 watt @ 115°C Derating to 0 @ 160°C
Max. Continuous Working Voltage	$\sqrt{PR}$	$\sqrt{PR}$
Min. Insulation Resistance Dry	10,000 Meg	10,000 Meg
Min. Insulation Resistance Wet	100 Meg	100 Meg
Min. Dielectric Withstanding Volts (RMS) ATM	1000 V	1000 V
Min. Dielectric Withstanding Volts (RMS) Reduced Pressure	625V	625V
Hotspot Temperature Rise	145°C @ 2 watts	145°C @ 2 watts
Typical Load Life	5%	5%
Current Noise	Negligible	Negligible

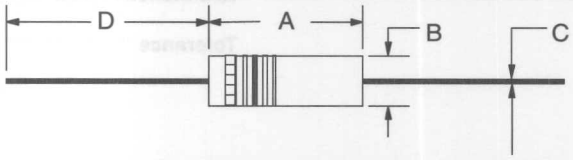
1. Resistive Element
All resistor types have resistance alloy winding on a braided fiberglass substrate. Intermediate silicone coatings are used to enhance processibility and to provide protection to the resistive element.

2. Termination
The SPH and SPF resistors are terminated using an alloy coated copper flashed steel lead welded to a cap of the same material. This termination assembly is mechanically crimped, utilizing an improved crimp design, to the resistive element.

3. Encapsulation
The SPH and SPF are encapsulated utilizing a compression molded phenolic plastic material. The SPF has a flame-resistance coating applied over the resistive element to provide flammability protection when destructive overloads may occur.

4. Marking
All products are marked utilizing heat and solvent resistant color code bands consistent with EIA/MIL requirements. The first band is double width to designate wirewound construction. A fifth band, blue in color, is used for flameproof identification.

DIMENSIONS (Inches and (mm)):



IRC TYPE	A	B	C	D
SPH	0.562±0.010 (14.3±0.25)	0.225±0.008 (5.72±0.20)	0.032±0.002 (0.813±0.05)	1.50±0.126 (38.1±3.2)
SPF	0.562±0.010 (14.3±0.25)	0.225±0.008 (5.72±0.20)	0.032±0.002 (0.813±0.05)	1.50±0.126 (38.1±3.2)

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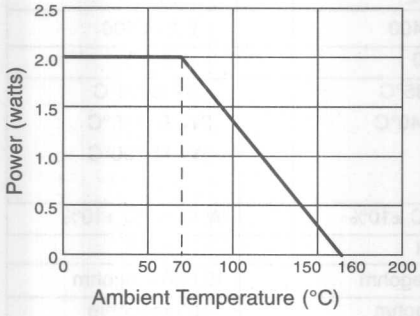
SPH/SPF CHARACTERISTICS (TYPICAL PERFORMANCE):

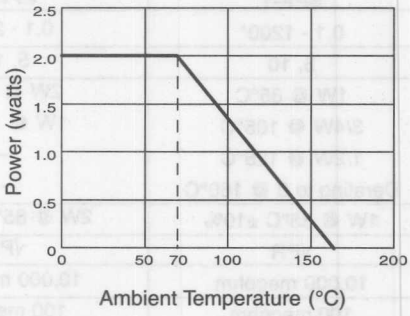
Test	SPH	SPF
Temperature Coefficient (ppm)*	0.1Ω - 0.16Ω ±1000 0.18Ω - 0.68Ω ±800 0.75Ω - 2400Ω ±400	0.10Ω ±1700 0.11Ω - 0.16Ω ±1000 0.18Ω - 0.68Ω ±800 0.75Ω - 1000Ω ±400
Dielectric Withstanding Voltage (RMS)	1000V	1000V
Momentary Overload	5%	5%
Low Temperature Operation	5%	5%
Temperature Cycle	5%	5%
Humidity	5%	5%
Load Life	5%	5%
Terminal Strength	5%	5%
Resistance to Solder Heat	5%	5%
Solderability	No Failures	No Failures

*All ppm levels listed are maximum.

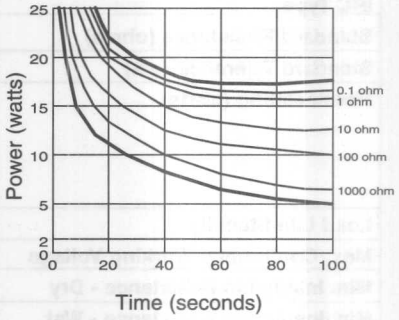
SPH POWER DERATING:



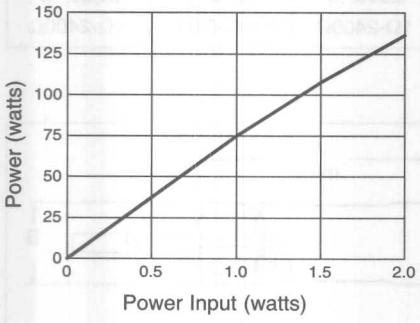
SPF POWER DERATING:



SPF TYPICAL FUSING:



SPH AND SPF TEMPERATURE RISE:



HOW TO ORDER:

Sample Part No.:

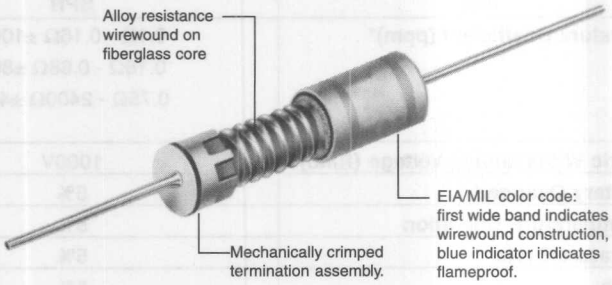
SPH 150Ω 5%

- IRC Type — SPH
- Resistance Range — 150Ω
- Tolerance — 5%

LOW-COST GENERAL PURPOSE CONFORMAL COATED WIREWOUND RESISTOR

ISO-9001 Registered

SPP SERIES



- Color band standard identification
- Coated or uncoated units
- Positive high TC's upon request
- Weldable and solderable magnetic leads
- Lower ranges available - contact factory

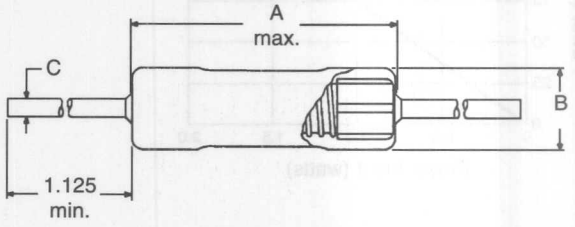
SPECIFICATIONS:

IRC Type	SPP-1		SPP-2		SPP-3	
Standard Resistance (ohms)	0.1 - 1200*		0.1 - 2400		0.1 - 2400	
Standard Tolerance (±%)	5, 10		5, 10		5, 10	
Power Rating (watts)	1W @ 85°C 3/4W @ 105°C 1/2W @ 125°C Derating to 0 @ 160°C		2W @ 85°C 1W @ 140°C --- ---		3W @ 85°C 2W @ 145°C 1W @ 190°C ---	
Load Life Stability	1W @ 85°C ±10%		2W @ 85°C ±10%		3W @ 85°C ±10%	
Max. Continuous Working Voltage	√PR		√PR		√PR	
Min. Insulation Resistance - Dry	10,000 megohm		10,000 megohm		10,000 megohm	
Min. Insulation Resistance - Wet	100 megohm		100 megohm		100 megohm	
Min. Dielectric Withstanding Voltage	600 volts RMS		600 volts RMS		600 volts RMS	
Current Noise	Negligible		Negligible		Negligible	
Temperature Rise at Rated Load, 25°C Ambient	Approx. 150°C		Approx. 200°C		Approx. 225°C	
Temperature Coefficient	±600/°C 0.10Ω-0.91Ω	±300/°C 1Ω-1200Ω	±600/°C 0.10Ω-0.91Ω	±300/°C 1Ω-2400Ω	±600/°C 0.10Ω-0.91Ω	±300/°C 1Ω-2400Ω

NOTE: Unless specified otherwise standard test centers are 1 3/4 inches.

DIMENSIONS (Inches):

IRC Type	A	B	C±.002
SPP-1	0.400 max.	0.148 max	0.032
SPP-2	0.570 max.	0.170 max	0.032
SPP-3	0.570 max.	0.170 max	0.032



FUSE/PULSE APPLICATIONS:

SPP resistors normally fuse in less than one minute with five to ten times rated wattage depending on the range. By modifying the windings, using a different wire size or type, they can be made to fuse much faster. On the other hand, by using larger wire diameters and higher melt temperature alloys they can handle from five to fifty times overloads of film resistors depending on the range.

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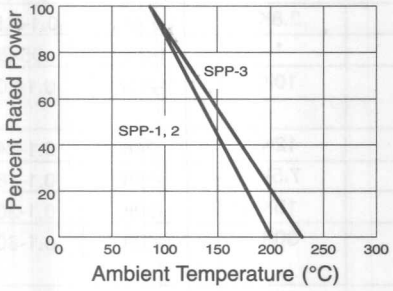
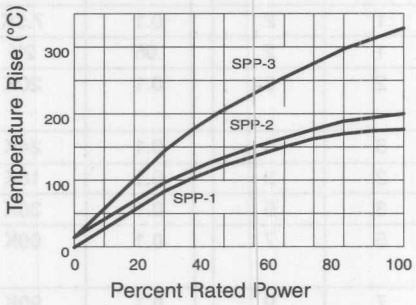
SPP CHARACTERISTICS:

	MAXIMUM LIMITS		
Temperature Coefficient	SPP-1	±600/°C	0.10Ω–0.91Ω
		±300/°C	1.0Ω-1200Ω
	SPP-2	±600/°C	0.10Ω–0.91Ω
		±300/°C	1.0Ω-2400Ω
	SPP-3	±600/°C	0.10Ω–0.91Ω
		±600/°C	1.0Ω-2400Ω
Thermal Shock	±5%		
Low Shock	±5%		
Short Time Overload	±5%		
Commercial Short Time Overload	±5%		
Resistance to Solder Immersion	±3%		
Solderability	95% minimum coverage		
Moisture Resistance	±5%		
Life Test	±5%		
Test Method	EIA Specification RS-344		

POWER DERATING:



TEMPERATURE RISE:



HOW TO ORDER:

Sample Part No.:

SPP 1 1K 5%

IRC Type — SPP

Power — 1
(See specification chart for other power ratings)

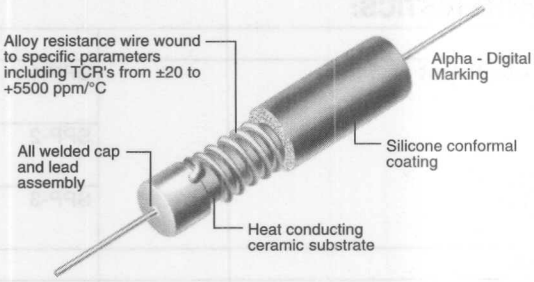
Resistance Value — 1K
Expressed in ohms
(Standard EIA/MIL values)

Tolerance — 5%
±5%, ±10% standard

SEMI-PRECISION POWER WIREWOUND RESISTOR

ISO-9001 Registered

AS SERIES



- 1/4 watt to 10 watts
- ±5%, ±3%, ±1%, ±.5% tolerance
- 0.1 ohm to 175K ohms
- Resistance wire TCR ±20 ppm/°C

SPECIFICATIONS:

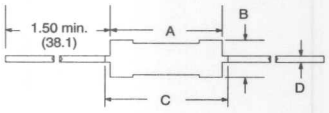
IRC Type	Equivalent MIL-R-26 Style	Power Rating 275°C Max. Hot Spot (watts)		Commercial Range (ohms)		Non-Inductive Range (ohms)		Available Resistance (ohms)	
		125°C	25°C	Min.	Max.	Min.	Max.	0.5%, 1%	3%, 5%
AS-1/4	RW81	0.5	1	0.1	1.0K	*	*	1-1K	0.1-1K
AS-1/2		0.5	1	0.1	6.0K	*	*	1-6K	0.1-6K
AS-1	RW70U	1	2	0.1	7.5K	0.1	3.8K	1-7.5K	0.1-7.5K
AS-1C		1	2	.05	2K	*	*	1-2K	.05-2K
AS-2	RW-69V/ RW79U	2	3	0.1	20K	0.5	10K	1-20K	0.1-20K
AS-2B		3	4	0.1	24K	0.5	12K	1-24K	0.1-24K
AS-2C		2	3	0.1	18K	0.2	7.5K	1-18K	0.1-18K
AS-3		3	5	0.1	30K	0.5	15K	1-30K	0.1-30K
AS-5	RW74U/ RW67V	5	7	0.1	60K	0.8	30K	1-60K	0.1-60K
AS-7		7	9	0.1	90K	1.0	45K	1-90K	0.1-90K
AS-10	RW68V/ RW78U	10	14	0.1	175K	3.0	50K	1-175K	0.1-175K

Inductance of AS-1/2 is less than 1μH at 1MHz.
To order non-inductive types, add the prefix "N". Example: NAS-1, NAS-2C, etc.

* Typical inductance of AS-1C <5 ohms is < 1μH.
Lower values available upon request.

DIMENSIONS (Inches and (mm)):

Please note lead length dimension change on the following two items only:
AS-2B 1.3 min
AS-2C 1.3 min



NOTE:
- Coating and marking is resistant to normal freon degreasing. Consult factory for special requirements.
- AS marking available in Alpha Numeric or Colorbanding - identification available.

IRC Type	A±0.032	B (max)	C (max)	D (Lead Diameter)
AS-1/4	0.250 (6.4)	0.094 (2.4)	0.312 (7.9)	0.020 (0.5)
AS-1/2	0.312 (7.9)	0.094 (2.4)	0.375 (9.5)	0.020 (0.5)
AS-1	0.367 (9.3)	0.125 (3.2)	0.429 (10.9)	0.020 (0.5) 0.025 (0.64)
AS-1C	0.256 (6.5)	0.115 (2.9)	0.303 (7.7)	0.025 (0.64) 0.032 (0.8)
AS-2	0.480 (12.2)	0.250 (6.3)	0.600 (15.2)	0.032 (0.8)
AS-2B	0.540 (13.7)	0.219 (5.6)	0.663 (16.6)	0.032 (0.8)
AS-2C	0.489 (11.0)	0.157 (4.0)	0.594 (15.1)	0.032 (0.8)
AS-3	0.687 (17.5)	0.282 (7.2)	0.812 (20.6)	0.040 (1.0)
AS-5	0.875 (22.2)	0.344 (8.8)	0.980 (24.9)	0.040 (1.0)
AS-7	1.250 (31.8)	0.344 (8.8)	1.375 (35.0)	0.040 (1.0)
AS-10	1.812 (46.0)	0.385 (9.8)	1.937 (49.2)	0.040 (1.0)

*Leads 60/40 are solder plated. AS-1C leads are copper. All others are 40% conductivity copper sheathed steel.

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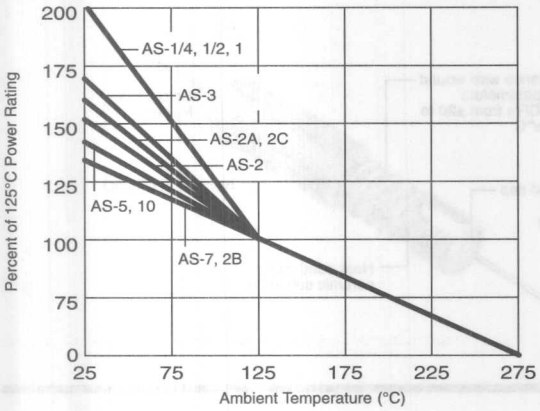
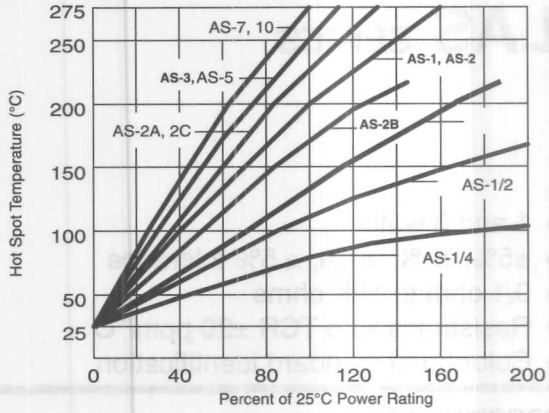
IRC

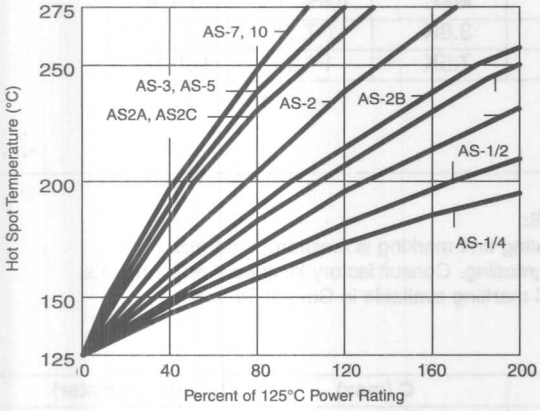
POWER DERATING:



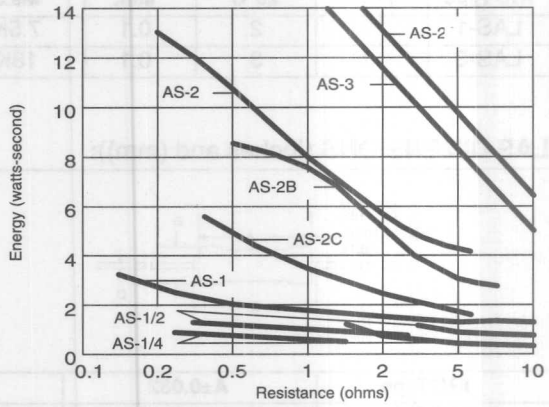
TEMPERATURE RISE @ 25°C:



TEMPERATURE RISE @ 125°C:



SELECTED PULSE-HANDLING CAPABILITY @ 125°C:



ENVIRONMENTAL TESTING AT 25°C:

TEST CONDITION	MAX ΔR
Load Life 1000 hours	1.0%
Moisture Resistance	1.0%
Temperature Cycle	0.5%
Short Time Overload	0.5%
Low Temperature Operation	0.5%
Solder Heat	0.25%
Shock	0.5%
Vibration	0.5%

HOW TO ORDER:

Sample Part No.:

AS-3 27R0 0.25%

Type

Power
3 =3 watts
(See specification chart for other power ratings)

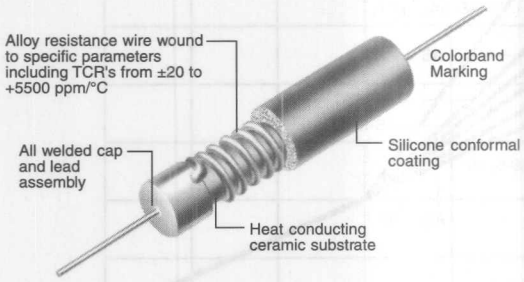
Resistance Value
Expressed in ohms
(Standard EIA/MIL Values)

Tolerance
±5%, ±3%, ±1%, ±0.5%

LOW COST SEMI-PRECISION POWER WIREWOUND RESISTOR

ISO-9001 Registered

LAS SERIES

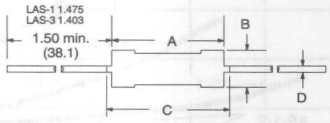


- 1 and 3 watts
- ±5%, ±3%, ±1%, ±.5% tolerance
- 0.1 ohm to 18K ohms
- Resistance wire TCR ±20 ppm/°C
- Color band standard identification.

SPECIFICATIONS:

	Power Rating 275°C Max. Hot Spot (watts)		Commercial Range (ohms)		Non-Inductive Range (ohms)		Available Resistance (ohms)	
IRC Type	125°C	25°C	Min.	Max.	Min.	Max.	0.5%, 1%	3%, 5%
LAS-1	1	2	0.1	7.5K	0.1	3.8K	1-7.5K	0.1-7.5K
LAS-3	2	3	0.1	18K	0.2	7.5K	1-18K	0.1-18K

LAS DIMENSIONS (Inches and (mm)):



NOTE:
- Coating and marking is resistant to normal freon degreasing. Consult factory for special requirements.
- LAS marking available in Colorband only.

IRC Type	A±0.032	B (max)	C (max)	D (Lead Diameter)
LAS-1	0.348 (8.84)	0.110 (2.80)	0.407 (10.34)	0.020 (0.53)
LAS-3	0.491 (12.47)	0.149 (3.80)	0.550 (13.99)	0.032 (0.81)

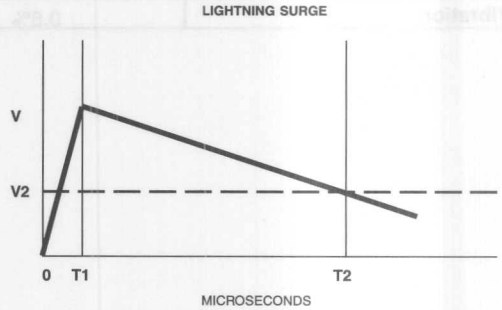
LAS-3 CARBON COMP REPLACEMENT (contact factory)

The LAS-3 is a three watt conformal coated precision wirewound resistor. The resistance wire is welded to the end caps and wound on alumina rod for good thermal conductivity.

In circuit applications that utilize two watt carbon comp resistors the LAS-3 is an ideal effective replacement. The LAS-3 5.6 ohm can be specifically designed to withstand 22 joules of energy delivered by a 1000 volt 10x1000 usec wave shape pulse.

Special LAS-3 5.6 ohm to 100 ohm will meet Telecom TR-1089 lightning requirements.

- V= 1000 volts
- T1=10 usec rise
- T2=1000 usec to V2
- 10 ohm output impedence



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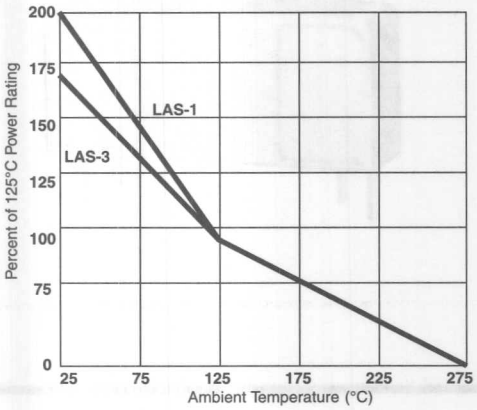
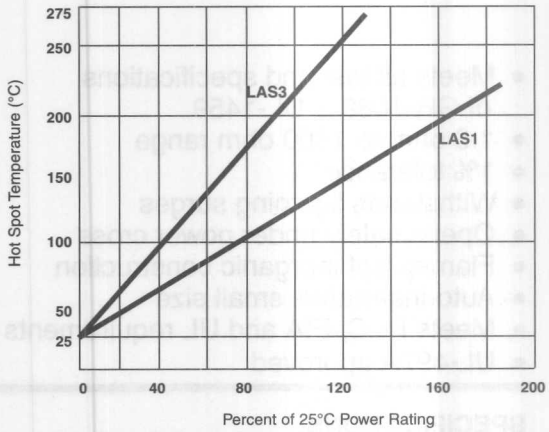
ISO-9001 Registered

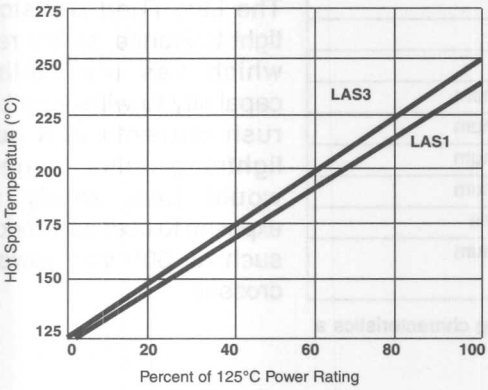
POWER DERATING:



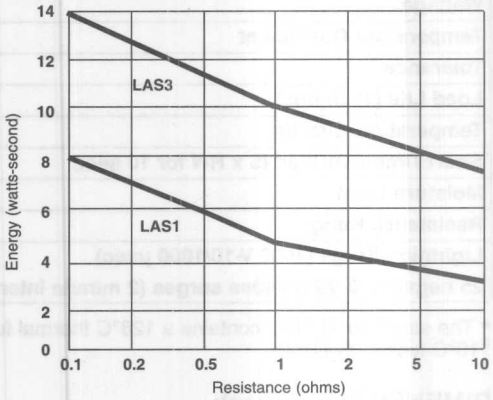
TEMPERATURE RISE @ 25°C:



TEMPERATURE RISE @ 125°C:



PULSE-HANDLING CAPABILITY @ 25°C:



ENVIRONMENTAL TESTING AT 25°C:

TEST CONDITION	MAX ΔR
Load Life 1000 hours	1.0%
Moisture Resistance	1.0%
Temperature Cycle	0.5%
Short Time Overload	0.5%
Low Temperature Operation	0.5%
Solder Heat	0.25%
Shock	0.5%
Vibration	0.5%

HOW TO ORDER:

Sample Part No.:

LAS-3 27R0 5%

Type

Power
3 =3 watts
1=1 watt

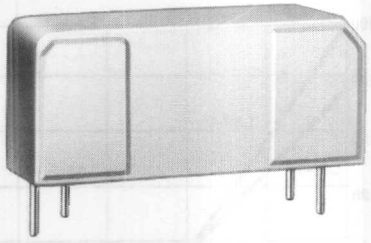
Resistance Value
Expressed in ohms
(Standard EIA/MIL Values)

Tolerance
±5%, ±3%, ±1%, ±0.5%

TELECOMMUNICATIONS LINE FEED RESISTORS

ISO-9001 Registered

ALFR-2 SERIES



- Meets all test and specifications of GR-1089 & UL-1459
- 1.8 ohm to 1600 ohm range
- 1% tolerance
- Withstands lightning surges
- Opens safely under power cross
- Flameproof inorganic construction
- Auto-insertable, small size
- Meets FCC, EIA and UL requirements
- UL-497A approved

SPECIFICATIONS:

Characteristics	Limits - ALFR-2
Wattage	2 watts
Temperature Coefficient	50 ppm/°C
Tolerance	1% and 5%
Load Life (1000 hrs.)	1% ΔR maximum
Temperature Cycling	1% ΔR maximum
Short Time Overload (5 x RW for 10 sec.)	1% ΔR maximum
Moisture Load	1% ΔR maximum
Resistance Range	1 to 1600 ohms
Lightning Surge (1000 V-10/1000 µsec) 25 negative & 25 positive surges (2 minute intervals)	2% ΔR maximum

• The standard ALFR-2 contains a 128°C thermal fuse. For faster fusing characteristics a 110°C fuse is available.

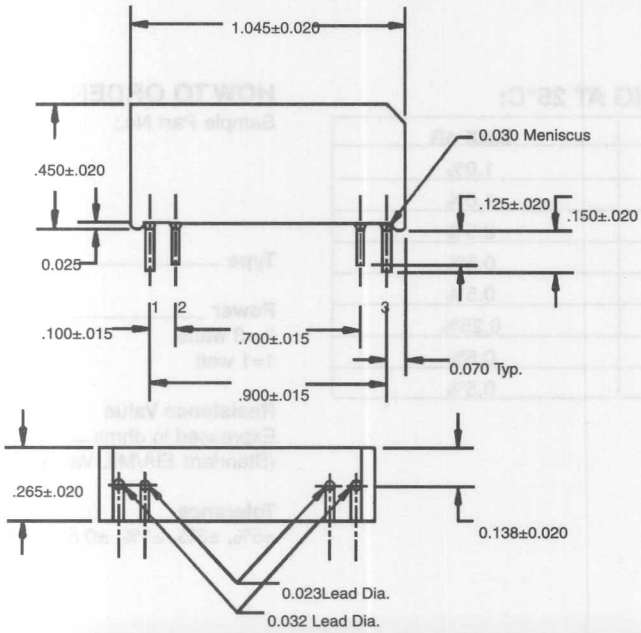
DESIGN & CONSTRUCTION:

The Line Feed Resistor is a tight tolerance, stable resistor which has the additional capability to withstand both in rush currents and certain lightning pulse surges but would fuse safely when exposed to overload conditions such as 600 volt power line crosses.

DIMENSIONS (Inches):

The four (4) terminal leads shall be in the line to a tolerance to ±0.015 inch. The lead spacing dimensions as specified, shall be measures from the tip of the lead to the tip of the lead. The leads may have a 15° draft relative to the protector body.

In circuit applications terminal leads 1 and 2 shall be connected together externally and leads 3 and 4 used for connection of the device. For proper performance and reduction of safety hazards the current flow should be from lead 3 to 4.



HOW TO ORDER:

Sample Part No.:

ALFR-2 1000 1%

- Type
- Power
- Resistance Value
- Tolerance ±1%, ±5%

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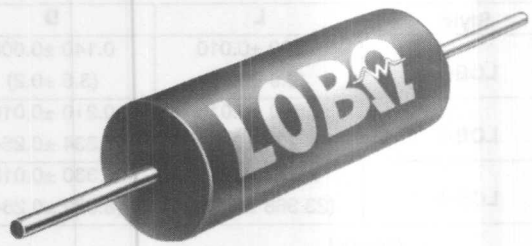
LOW RESISTANCE METAL ELEMENT RESISTOR

ISO-9001 Registered

IRC

LOB SERIES



- Ultra low resistance values (0.005Ω to 0.1Ω)
- Available in 1-watt, 3-watt and 5-watt rated packages
- Tolerances from ±1% to ±5%
- Inherently non-inductive (≤.02μh @ 0.5MHz)
- Low temperature coefficient of resistance
- High stability over life

DESCRIPTION:

LOBΩ Series power precision metal element resistors feature resistance values down to 0.005Ω with virtually no inductance. Available in 1-, 3- and 5-watt rated axial leaded packages, these resistors are compatible with automatic insertion equipment.

APPLICATIONS:

- Switchmode and linear power supplies.
- Automotive current-sensing circuits
- Instrumentation
- Regulators

CONSTRUCTION:

LOBΩ Series resistors feature tinned copper leads welded directly to a low-temperature coefficient resistance element in a highly automated proprietary process. The leaded resistor elements are then encapsulated in a molding compound.

ABSOLUTE MAXIMUM RATINGS:

CHARACTERISTIC	LOB-1	LOB-3	LOB-5	Units
Continuous power dissipation @ 25°C in free air	1	3	5	Watts
Overload power for 5 seconds	5	15	25	Watts
Maximum working voltage	$\sqrt{1xR}$	$\sqrt{3xR}$	$\sqrt{5xR}$	Volts
Maximum storage temperature	175	175	175	°C

***Power Dissipation -** The maximum wattage rating depends upon the amount of heat which can be transferred to the surroundings while not exceeding the maximum element temperature. Ambient air temperature, velocity of cooling air, thermal resistance of heat, and the temperature of surrounding objects will affect this transfer, and must be taken into account when selecting a resistor.

GENERAL SPECIFICATIONS - ENVIRONMENTAL TESTING*:

TEST PARAMETERS	MIL-STD 202	MAX %ΔR *	Unit
Load Life (2,000 hours)	Method 108	±1%	%ΔR
Thermal Shock	Method 107	±1%	%ΔR
Vibration	Method 204	±0.5%	%ΔR
Mechanical Shock	Method 213	±0.5%	%ΔR
Dielectric Strength	Method 301	±0.5%	%ΔR
Insulation Resistance	Method 302	$>10^{11}$	Ohms

*±0.0005 ohm allowance for test/contact error.

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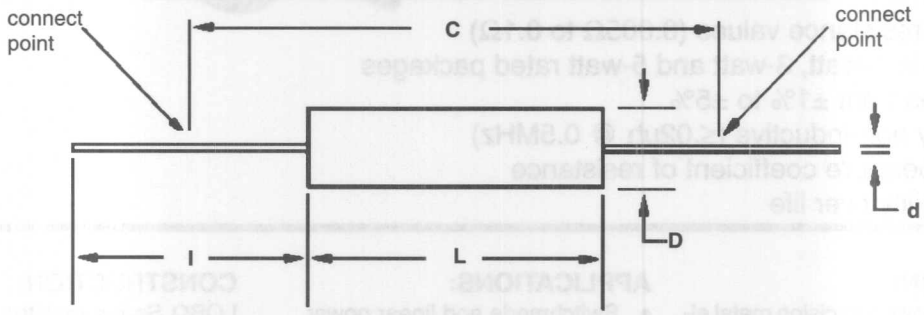
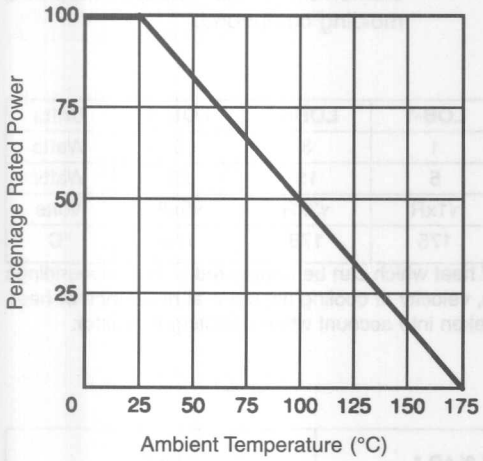
LOB DIMENSIONS (Inches and (mm)):

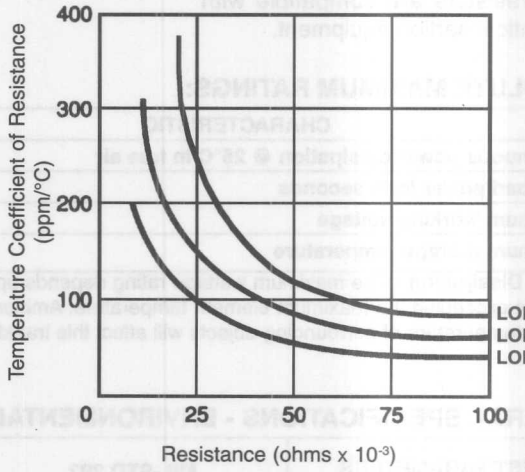
Style	L	D	C	l	d
LOB-1	0.390 ±0.010 (9.9 ±0.3)	0.140 ±0.008 (3.6 ±0.2)	1.31 (33.274)	1.50 ±0.125 (38.1 ±3.2)	0.0305 ±0.002 (0.813 ±0.051)
LOB-3	0.560 ±0.010 (14.224 ±0.254)	0.210 ±0.010 (5.334 ±0.254)	1.31 (33.274)	1.375 ±0.125 (34.925 ±3.175)	0.0305 ±0.002 (0.813 ±0.051)
LOB-5	0.920 ±0.010 (23.368 ±0.254)	0.330 ±0.010 (8.382 ±0.254)	1.670 (42.418)	1.250 ±0.125 (31.750 ±3.175)	0.040 ±0.002 (1.016 ±0.051)



POWER DERATING PERCENTAGE VS. FREE AIR AMBIENT TEMPERATURE:



TEMPERATURE COEFFICIENT OF RESISTANCE VS. RESISTANCE VALUE:



HOW TO ORDER:

To order, specify style, resistance value, tolerance and package type as in the following example:

LOB-3 0.01Ω 1% LT

Style
LOB-1 (1 watt)
LOB-3 (3 watt)
LOB-5 (5 watt)

Resistance Value

0.005Ω	0.02Ω	0.04Ω	0.08Ω
0.01Ω	0.025Ω	0.05Ω	0.1Ω
0.015Ω	0.03Ω	0.07Ω	Contact factory for other values

Tolerance
5%, 3%, 1% - All styles/values

Packaging
LT (Lead Tape) 500 pcs. min.
LOB-1 3500pcs. max
LOB-3 1250 pcs. max.
LOB-5 800 pcs. max.

BLK (Bulk Pack) 500/box packed loose in box

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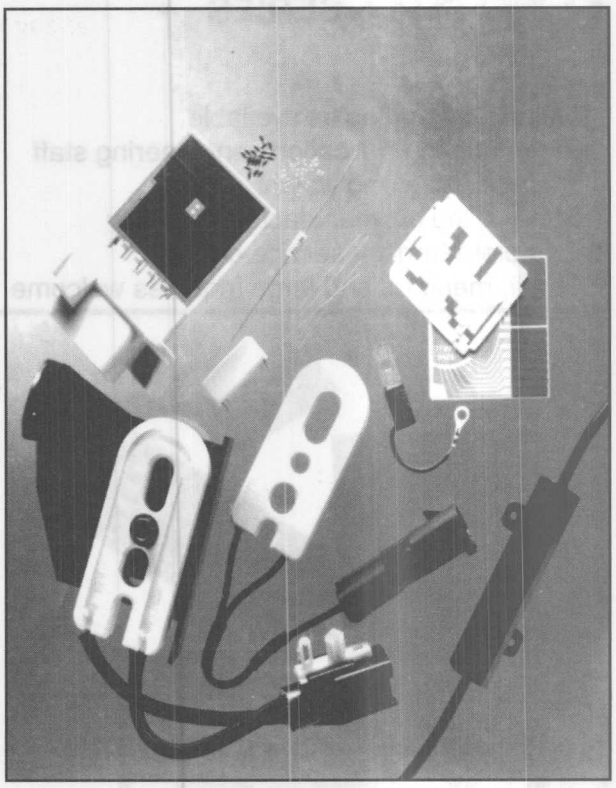
CUSTOM PRODUCTS AND ASSEMBLIES

ISO-9001 Registered

IRC



Let IRC's Engineering staff design and build a resistor for your specific requirement.

In addition to the many standard SMD or Through-Hole products available in this catalog IRC offers:

- **POWER** - Available from 1/2 watt through 100 watts and beyond with our new TFS (Thick Film on Steel) product.
- **TCR** - High positive TCR's available with ratings of 1250 ppm, 4500 ppm and 5500 ppm. (Other TCR'savailable.)
- **FUSES** - By combining your fusing parameters with IRC's expertise a wirewound or film product can be designed to fuse under very specific conditions.
- **PULSE/SURGE PROTECTION** - Specifically designed for applications requiring 5% toleranceor tighter and/or a low temperature coefficient in a flameproof package.
- **PACKAGE** - Special ceramic packages available or we will custom design the product to specifically fill your requirement.
- **LOW RESISTANCE** - Resistance values available down to 0.001 ohm for current sensing applications.
- **VALUE ADDED** - As an example: We can provide any wirewound element with appropriate quick disconnect terminal, sealed connector, stranded insulated lead wires, sleeving and other combinations - check us out. Let IRC design to your specific needs.

HOW TO ORDER:
Consult factory.

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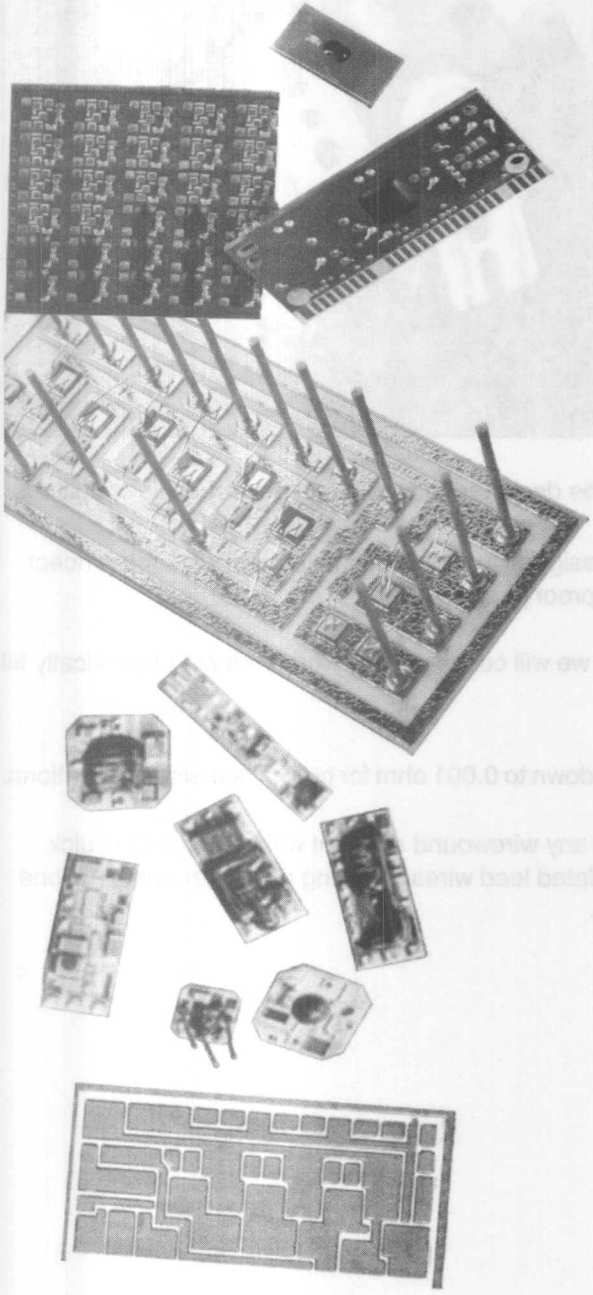
HYBRID SERIES

- Multiple technologies available
- Experienced applications engineering staff
- Reduced size and weight
- State of the art manufacturing facility
- Complete turnkey service center
- Small, medium, and large inquiries welcome



Chip on Board Technology

- Fiber Optic Data Transmission
- Industrial Switches and Sensors
- Rigid and Flexible Circuit Boards Available

Industrial Power Modules

- Integrated IGBT Modules for AC-Drives
- Variable Speed Motor Drives
- AC Servo Drives / AC Switches
- Power Range: 600V / 6 Amp to 1200V / 30 Amp

Chip and Wire Technology

- High Speed Data Transmission
- Signal Conditioning and Filtering
- Military Power Supplies
- Hermetic Packages for Military / Hi-Rel Applications

Thick Film Copper

- Fan Speed Controls
- Current Sense / Feed Back Circuits
- DC to DC Converters / Motor Drives

HOW TO ORDER: Contact factory for custom ordering information.

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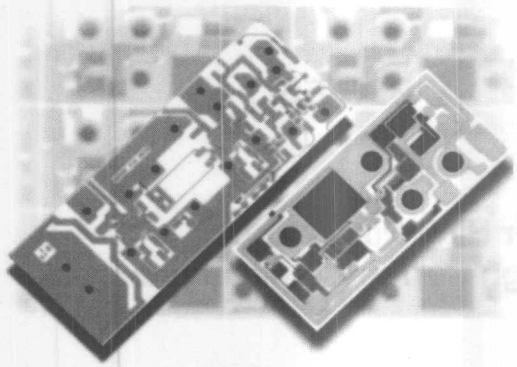
HYBRID CIRCUIT SUBSTRATES

ISO-9001 Registered

HYC SERIES



- Thin Film Technology
- Built To Customer Requirements
- Tight Tolerance and Ratio Matching
- Solderable and Wire Bondable Conductor Available

IRC, with over 30 years experience in Thin Film deposition technology, offers precision metalized substrates for the most demanding hybrid applications. The unique characteristics of IRC's self-passivated Tanatalum Nitride film insure accuracy and long term stability even in harsh environments.

IRC's continuous sputtering and proprietary vacuum anneal processes along with state-of-the-art laser adjust equipment provide the consistent, high stability performance characterstics for which TaNFilm® products are known.

PRODUCTION

FACILITY	
Total Area	75,000 sq. feet
Class 100 Clean Room	2,600 sq. feet
Class 1000 Clean Room	2,700 sq. feet

METALIZATION

Thin Film	Tantalum Nitride	Platinum
	Titanium	Aluminum
	Palladium	Nickel
Electroplated	Gold Copper Nickel Sn/Pb Solder	

Note: Double sided metalization is available - consult factory.
Metalization available on 1 or 2 sides.
Through hole plating and vias available.

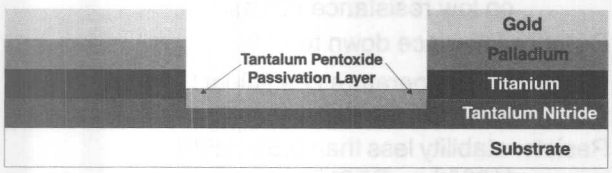
KEY TECHNOLOGIES

In-Line Continuous Sputtering Capability
TCR Control t ±10 ppm/°C
Plasma Etch
State-of-the-Art Computer Controlled Laser Trimmers
(Untrimmed resistors available)

SPECIFICATIONS

DESIGN GUIDELINES	
Conductor Trace Width (min)	1 mil (25.4μm)
Resistor Trace Width (min)	0.7 mil (18μm)
Resistor Material	Tantalum Nitride
Resistor Ohms per Square	5 - 100
Resistor Uniformity	3% over a 1" area
Stability at 125°C, 1000 hours	<0.05% ΔR/R
RESISTOR TOLERANCES	
Absolute	To ±0.05%
Ratio	To ±0.01%
TEMPERATURE COEFFICIENT	
TCR Absolute	To ±10ppm/°C
TCR Tracki	To ± 5ppm/°C
SUBSTRATE	
Material	99.6% Alumina
Thickness (mils)	15, 20, and 25
Dimensions	Up to 3.75" x 4.5"
Surface Finish	3μ inches
Dissipation Factor	
1 kHz	0.0003
1 MHz	0.0001
Dielectric Strength	600 V/mil
Dielectric Constant	9.9 ±0.1
Volume Resistivity	>10^{14} S-cm
Thermal Conductivity @ 70°C	34.7 W/m°K

TYPICAL METALIZATION



A self-passivating layer, which protects the resistive elements from the outside environment, is unique to IRC's TaNFilm® process.

HOW TO ORDER

Consult factory for custom ordering information.

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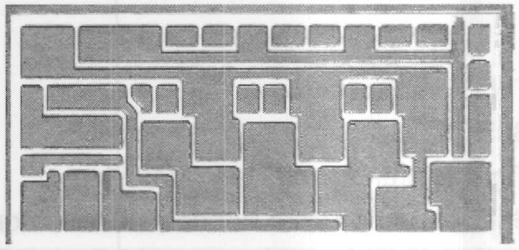
THICK FILM PRINTED COPPER SUBSTRATES

ISO-9001 Registered

IRC

TFC SERIES



For High Power and High Current Applications

- High Current/Low Resistance Traces
- Low Thermal Resistance - to 0.2°K/W
- Copper On One or Both Sides
- Low Cost Alternative to Direct Bonded Copper
- Integrated Current Sense Resistors Available

TFC is a newly developed thickfilm technology for electronic power circuits. In a special screen printing process, copper structures are printed onto a 96% alumina ceramic substrate and fired at temperatures approaching 1000°C.

The copper paste used for this process is a patented formulation of IRC's Advanced Film Division in Corpus Christi, TX. High quality, economical power substrates is achieved using our low cost non-noble system with highly automated printing equipment. Additionally, integrated current sense and other resistors are available and may be added to the circuit to increase performance and reduce overall board size.

To improve solderability or bondability, electroplated conductors are available with a variety of metals. Selective Sn/Pb solder tinning is also available on conductors.

The thermal expansion coefficient is determined by the substrate (alumina) and is very similar to silicon. Good heat transfer is achieved due to the reactive bonding of the copper to the substrate material.

HOW TO ORDER

Consult factory for custom ordering information.

TFC Substrates:

Adhesive Strength of copper:	>20 N/mm²
Temperature stability:	850°C (cover gas) 350°C (air)
Thermal expansion:	7.3 ppm/°K
Thermal resistance:	0.2K/Watt (.38mm substrate)
Copper resistivity:	0.2mΩ/❑ (180µm thick)

Substrates:

96% Alumina; thicknesses from 0.25mm to 1.0mm (0.010" to 0.040").

Substrate sizes up to 4.5" x 6.25".

Substrates laser scribed or green scored.

Conductors:

Copper conductors on one or both sides.

Conductor thickness: 20 µm to 250 µm.

Conductor width: 0.5mm min.

Space between conductors: 0.5mm min.

Screen printing tolerance: ±0.25mm

Plating materials available: Cu, Ni, Au, SnPb.

Selective solder tinning available.

Resistors:

Ohmic range down to 0.001 ohms.

Four terminal (Kelvin) connections available on low resistance values.

Resistor tolerance down to ±1%.

Resistance temperature coefficient typically less than 100ppm/°C.

Resistor stability less than 0.5% ΔR/R (1000 hrs @70°C).

ADVANCED FILM DIVISION
4222 South Staples Street • Corpus Christi, Texas 78411 • Tel: 361-992-7900 • Fax: 361-992-3377 • www.irctt.com

SEMI-PRECISION POWER WIREWOUND RESISTORS

ISO-9001 Registered

IRC

T SERIES

MIL-R-26 (RW), MIL-R-39007 (RWR) & COMMERCIAL STYLES

NOTE: Special MIL qualified overcoat available when application requires lifetime durability and meets with ease new MIL-STD-202F Method 215G. Specify VC.

- 0.1 ohm to 300K ohms
- 1.0 to 14 watts
- ±1 to ±0.1% tolerance
- Non-inductive windings available
- Meets or exceeds all applicable MIL-R-26 & MIL-R-39007 ratings
- Established reliability documented failure rate 100% screening (S failure rate approval)

SPECIFICATIONS:

Style	MIL-R-26 Style	Wattage Rating		Resistance Range (ohms)				Maximum Working Voltage
				Commercial		MIL-R-26		
		U	V	Min Ω	Max KΩ	Min Ω	Max KΩ	
T-1/2	---	0.75	---	0.1	4	---	---	54.77
T-1/2-A81/LA268	RW81	1.0	---	0.1	4.5	0.1	1	67.1
T-1A-70/LA449	RW70	1.0	---	0.1	12	0.1	3.16	109.5
T-1-80/LA249	RW80	2.0	---	0.1	12	0.1	3.16	154.9
T-2A *	---	3.0	3.75	0.1	25	---	---	306.2
T-2A-69/LA417	RW69	---	3.0	0.1	20	0.1	2	244.9
T-2B-79/LA461	RW79	3.0	---	0.1	40	0.1	10.5	346.4
T-3*	---	4.0	5.5	0.1	38	---	---	457.2
T-5*	---	5.0	6.5	0.1	45	---	---	540.8
T-5-74/LA446	RW74	5.0	---	0.1	94	0.1	38.3	685.5
T-6	---	6.0	7.5	0.1	65	---	---	698.2
T-6-67/LA419	RW67	5.0	6.5	0.1	92	0.1	8.2	773.3
T-7 *	---	7.0	9.0	0.1	115	---	---	1017.3
T-7A-55	RW55	---	7.0	0.1	200	0.1	3.4	1183.2
T-10A-56	RW56	---	14.0	0.1	300	0.1	9.1	2049.4
T-10*	---	10.0	13.0	0.1	300	---	---	1974.8
T-10-78/LA433	RW78	10.0	---	0.1	300	0.1	90.9	1732.0
T-10-68/LA433	RW68	---	11.0	0.1	300	0.1	20	1816.6

*Available as radial lead = type TR. To designate non-inductive winding add prefix "N" to style.

Style	MIL-R-39007 Style	Wattage at 25°C	Resistance Range (ohms)			Maximum Working Voltage
			Min 0.1 %	Min 1.0%	Max	
PR268	RWR81	1	0.499	0.1	1K	31.6
PR66	RWR82	1.5	0.499	0.1	1.3K	44.2
PR462	RWR71	2	0.499	0.1	16.2K	180.0
PR249	RWR80	2	0.499	0.1	3.16K	79.5
PR261	RWR89	3	0.499	0.1	4.12K	111.2
PR446	RWR74	5	0.499	0.1	12.1K	246.0
PR246	RWR84	7	0.499	0.1	12.4K	294.6
PR433	RWR78	10	0.499	0.1	39.2K	626.1

ISO-9001 Registered

IRC

T SERIES GENERAL SPECIFICATIONS:

Temperature Range	Characteristic U = -55°C to +275°C Characteristic V = -55°C to +350°C
Standard Temperature Coefficient	±20 ppm/°C 10Ω up ±50 ppm/°C 1.0Ω to 9.9Ω ±400 ppm/°C 0.50Ω to 0.999Ω ±650 ppm/°C 0.1Ω to 0.490Ω
Special Temperature Coefficients	Available from -30 ppm/°C to +6000 ppm/°C Temperature range for special TC's -50°C to +150°C
Insulation Resistance	1000 megohms minimum dry at 100 volts DC
Derating	Wattage rating based on operation at 25°C Derate to zero at 275°C & 350°C for "U" and "V" style rating

Lead Material:

Tinned copperweld is standard.
Also available: Weldable Grade A nickel (bare)

Special Features:

- Radial lead available.
- Resistance network packages designed to individual customer requirements.
- Temperature coefficient matching and tracking to ±5 ppm.
- High thermal conductivity core (Beryllium Oxide) available.
- Ratio Tolerance matched sets available.

IRC/Shallcross Style	A		B		C	
	Inches	mm	Inches	mm	inches (±0.002)	mm (±0.05)
T-1/2	0.330 (±0.062)	8.4 (±1.6)	0.078 (±0.031)	2.0 (±0.8)	0.020	0.5
T-1/2-A81/LA268	0.250 (±0.032)	6.4 (±0.8)	0.085 (±0.020)	2.2 (±0.5)	0.020	0.5
T-1A-70/LA449	0.406 (±0.032)	10.3 (±0.8)	0.094 (±0.032)	2.4 (±0.8)	0.020	0.5
T-1-80/LA49	0.406 (±0.032)	10.3 (±0.8)	0.094 (±0.032)	2.4 (±0.8)	0.020	0.5
T-2A	0.500 (±0.062)	12.7 (±1.6)	0.187 (±0.031)	4.8 (±0.8)	0.032	0.8
T-2A-69/LA417	0.500 (±0.063)	12.7 (±1.6)	0.188 (±0.063)	4.8 (±1.6)	0.032	0.8
T-2B-79/LA461	0.560 (±0.062)	14.2 (±1.6)	0.187 (±0.031)	4.8 (±0.8)	0.032	0.8
T-3	0.625 (±0.062)	15.8 (±1.6)	0.250 (±0.062)	6.3 (±1.6)	0.040	1.0
T-5	0.875 (±0.062)	22.2 (±1.6)	0.312 (±0.062)	7.9 (±1.6)	0.040	1.0
T-5-74/LA446	0.875 (±0.062)	22.2 (±1.6)	0.312 (±0.062)	7.9 (±1.6)	0.040	1.0
T-6	1.000 (±0.062)	25.4 (±1.6)	0.312 (±0.062)	8.0 (±1.6)	0.040	1.0
T-6-67/LA419	1.000 (±0.094)	25.4 (±2.4)	0.313 (±0.063)	8.0 (±1.6)	0.032	0.8
T-7	1.185 (±0.062)	30.0 (±1.6)	0.312 (±0.062)	8.0 (±1.6)	0.040	1.0
T-7A-55	1.375 (±0.094)	35.0 (±2.4)	0.469 (±0.094)	12 (±2.4)	0.032	0.8
T-10A-56	2.000 (±0.094)	50.8 (±2.4)	0.469 (±0.094)	12 (±2.4)	0.032	0.8
T-10	1.812 (±0.062)	46.0 (±1.6)	0.375 (±0.062)	9.5 (±1.6)	0.040	1.0
T-10-78/LA433	1.780 (±0.062)	45.2 (±1.6)	0.375 (±0.062)	9.5 (±1.6)	0.040	1.0
T-10-68/LA433	1.875 (±0.063)	47.6 (±1.6)	0.344 (±0.094)	8.7 (±2.4)	0.032	0.8
PR268	0.250 (±0.032)	6.4 (±0.8)	0.085 (±0.020)	2.2 (±0.5)	0.020	0.5
PR66	0.312 (±0.016)	7.92 (±0.4)	0.078 (±0.016)	1.98 (±0.4)	0.020	0.5
PR462	0.812 (±0.062)	20.6 (±1.6)	0.188 (±0.031)	4.8 (±0.8)	0.032	0.8
PR249	0.406 (±0.032)	10.3 (±0.8)	0.094 (±0.031)	2.4 (±0.8)	0.020	0.5
PR261	0.560 (±0.062)	14.2 (±1.6)	0.187 (±0.031)	4.8 (±0.8)	0.032	0.8
PR446	0.875 (±0.062)	22.2 (±1.6)	0.312 (±0.031)	7.9 (±0.8)	0.040	1.0
PR246	0.875 (±0.062)	22.2 (±1.6)	0.312 (±0.031)	7.9 (±0.8)	0.040	1.0
PR433	1.78 (±0.062)	45.2 (±1.6)	0.375 (±0.031)	9.53 (±0.8)	0.040	1.0

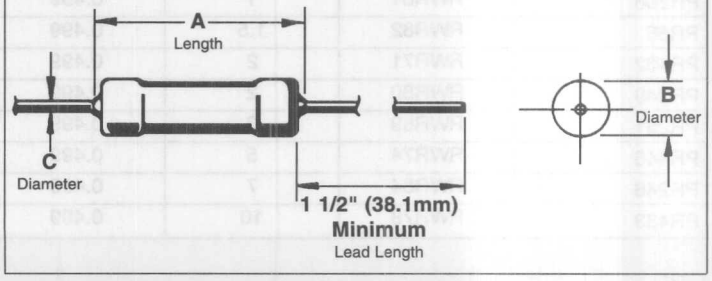
HOW TO ORDER:

Sample Part No.:

RW79 U 49R9 F

Style — RW79
Characteristic — U
Resistance Value — 49R9
St. EIA/MIL Values
Tolerance — F
B=±0.1%, D+±0.5%, F=±1%

For commercial equivalents:
Style - Resistance - Tolerance



WIREWOUND AND FILM TECHNOLOGIES DIVISION
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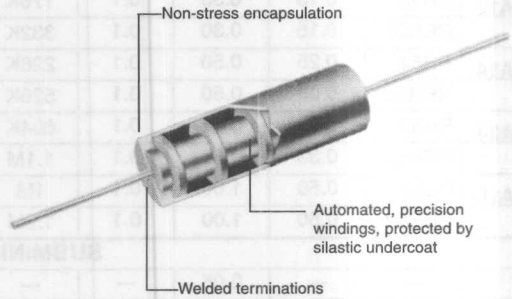
AXIAL LEAD PRECISION WIREWOUND RESISTORS

ISO-9001 Registered

HR, VA, SP, 7000, 8000 SERIES

MIL-R-93 (RB) & MIL-R-39005 (RBR) & COMMERCIAL STYLES



- 0.1 ohm to 12 meg ohms
- 0.1 to 1.0 watts
- Tolerance to ±.01%
- Approved to M, P, & R levels
- TC's from ±2 ppm/°C to +6000 ppm/°C
- Meets or exceeds all applicable MIL-R-93 & MIL -R-39005 ratings

These ultra precision resistors are designed and produced for critical parameter applications. They are available for established reliability military and/or commercial applications requiring state of the art precision and stability.

Construction features may vary slightly between commercial and military styles, but both are produced under the same rigid quality control system required by the tightest military specifications. Both are produced in the same production line using the same highly trained operators required to produce the established reliability product.

Whether military or commercial, all resistors are carefully monitored during assembly, winding, coating, and stabilization procedures to assure high quality standards even when their prescribed parameters are non critical. Premium grade selected wire is control stress wound on special designed bobbins. All terminations are welded to reduce contact noise and thermal EMF. Extensive accelerated aging programs both before and after calibration assure precise initial accuracy and high resistance stability.

Encapsulation is accomplished by transfer molding with special moisture resistant epoxy or by unique dry air chamber epoxy shell technique for established reliability parts. A resilient inner coating is used to minimize internal stresses on all parts.

The established reliability military parts are burned in 100 hours at 125°C ambient as part of group A acceptance testing. Documentation and special test are available upon customer request to meet your unique requirements.

MIL-R-39005 SPECIFICATIONS:

Temperature Range	Standard Temperature Coefficient
-65°C to +145°C	±10 ppm/°C 100Ω up ±15 ppm/°C 10Ω to 100Ω ±30 ppm/°C 1Ω to 10Ω ±90 ppm/°C below 1Ω Special Temperature Coefficients Available

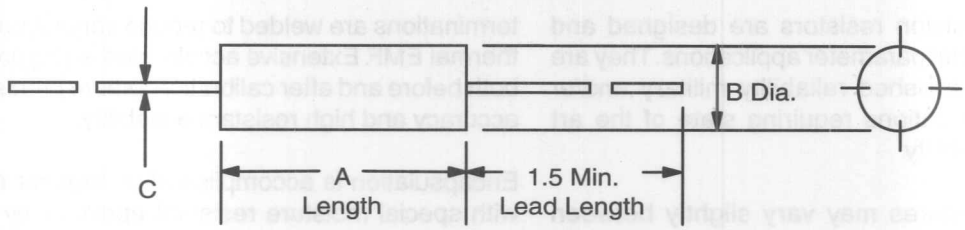
ISO-9001 Registered

IRC

HR, VA, SP, 7000, 8000 SERIES SPECIFICATIONS:

IRC/ Shallcross Style	MIL-R-93 / 39005 Style	Wattage MIL 125°C	Wattage Comm 85°C	Resistance (ohms) Mil Min	Resistance (ohms) Mil Max	Resistance (ohms) Comm Max	Max. Working Volt (Comm)	Dimensions ±0.032A Inches (mm)	Dimensions ±0.015B Inches (mm)	Dimensions ±0.002C Inches (mm)
7009/VA10	RB56	0.125	0.250	0.1	127K	1.4M	200	0.343 (8.7)	0.250 (6.3)	0.032 (0.8)
HR10	RBR56	0.125	0.250	0.1	220K	840K	200	0.343 (8.7)	0.250 (6.3)	0.032 (0.8)
7010/VA12	RB55	0.15	0.33	0.1	176K	3M	300	0.500 (12.7)	0.250 (6.3)	0.032 (0.8)
HR12	RBR55	0.15	0.30	0.1	332K	1M	300	0.500 (12.7)	0.250 (6.3)	0.032 (0.8)
7020/VA14	RB54	0.25	0.50	0.1	226K	4.4M	300	0.750 (19.0)	0.250 (6.3)	0.032 (0.8)
HR14	RBR54	0.25	0.50	0.1	526K	2M	300	0.750 (19.0)	0.250 (6.3)	0.032 (0.8)
7030/VA34	RB53	0.33	0.66	0.1	604K	8M	500	0.750 (19.0)	0.375 (9.5)	0.032 (0.8)
HR34	RBR53	0.33	0.66	0.1	1.1M	3M	500	0.750 (19.0)	0.375 (9.5)	0.032 (0.8)
7040/VA36	RB52	0.50	1.00	0.1	1M	12M	750	1.00 (25.4)	0.375 (9.5)	0.032 (0.8)
HR36	RBR52	0.50	1.00	0.1	1.2M	3M	750	1.00 (25.4)	0.375 (9.5)	0.032 (0.8)
SUBMINIATURES										
7004	---	---	0.05	---	---	250K	150	0.30(7.6)	0.10 (2.5)	0.020 (0.5)
7005/SP41	---	---	0.10	---	---	300K	150	0.25 (6.3)	0.125 (3.2)	0.025 (0.6)
7006	---	---	0.10	---	---	350K	200	0.31 (7.9)	0.125 (3.2)	0.025 (0.6)
7007/SP21	---	---	0.250	---	---	700K	300	0.375 (9.5)	0.188 (4.8)	0.025 (0.6)
SP42	---	---	0.125	---	---	200K	200	0.375 (9.5)	0.125 (3.2)	0.025 (0.6)

*For all styles commercial ratings may be applied at 125°C provided 175°C max. operating temperature is permissible. **Customer must specify TCR required.
NOTE: Contact factory for availability of other styles and sizes of above product.



HOW TO ORDER

Sample Part No.:

RBR52 L 12601 B R

Style

Terminal
L = Solderability, U = Weldable

Resistance

Tolerance

Failure Rate

For commercial equivalents:
Style - Resistance - Tolerance - TCR

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PRECISION WIREWOUND PRINTED CIRCUIT BOARD & RADIAL LEAD RESISTOR

ISO-9001 Registered

IRC

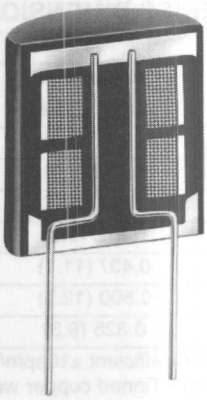
PC, HR, 4000 SERIES

MIL-R-93 (RB) & MIL-R-39005 (RBR) & COMMERCIAL STYLES

Welded Terminations

Wire terminations made at top of resistor
-Protects joints from solder bath damage
-Body acts as heat sink providing additional termination protection

Custom designs available



Insulated stress relieved windings

Optional lead materials

Different lead spacing furnished on request

- 0.100 to 0.600 watts
- Tolerance to ±0.01% (25°C)
- Non-inductive windings available
- TC's from ±2 ppm/°C to +6000 ppm/°C
- Meets or exceeds all applicable MIL-R-93 & MIL-R-39005 ratings

Miniature printed circuit resistors incorporate an uncommon number of production and design refinements to assure excellent resistance stability, close resistance tolerances, low TCR capabilities and high structural strength. To assure their high quality standards, premium grade selected wire is reverse pi wound with minimum stress on high temperature epoxy bobbins, permeated with a resilient inner cushion coat, and isolated from the external protective shell by a special dry air chamber.

To promote additional resistance stability and accurate initial calibrations all resistors are subjected to an extensive accelerated aging program. Weldable and/or solderable leads (a choice of lead material is available) are firmly anchored and bonded inside the bobbin for maximum structural strength. All resistor markings are impervious to printed circuit board cleaning solvents and lead spacing is sufficiently well controlled for automatic insertion on standard grid boards.

SPECIAL SCREENING / ACCEPTANCE TEST:

Special tests can be performed on a 100% or sample basis, to meet individual customer requirements. Some of the available non-destructive test include:

-Short Time Overload
-Thermal Shock
-Temperature Coefficient of Resistance
-Radiographic Inspection

Each of these tests is designed to detect a spectrum of potential resistor defects. Consult the factory for recomendations and a quotation on special screening or acceptance tests to meet your needs.

ELECTRICAL SPECIFICATIONS:

IRC/Shallcross Style**	MIL-R-93/ MIL-R-39005 Style	Wattage		Resistance (ohms)		Maximum Working Voltage
		MIL 125°C	Comm* 85°C	MIL Max	Comm* Max	
HR-8	RBR71	0.125		150K		300
4060/PC8	RB71	0.125	0.250	100K	500K	300
4065	RB70	0.250	0.333	301K	1.5M	150
4061	---	---	0.250	---	800K	300
4067	---	---	0.400	---	3M	300
HR 340	RBR81	0.100		250K		300
HR 341	RBR80	0.100		120K		150

*Commercial ratings may be applied at 125°C provided 175°C max. operation temperature is permissible. **Available as High Reliability styles with complete documentation.

ISO-9001 Registered

PC, HR, 4000 SERIES DIMENSIONS (Inches and (mm)):

IRC Shallcross Style	A Inches (mm) ±0.032 (±0.8)	B Inches (mm) ±0.025 (±0.6)	C Inches (mm) Minimum	D Inches (mm) ±0.002 (±0.05)	E Inches (mm) ±0.010 (±0.25)
HR-8	0.312 (7.9)	0.250 (6.3)	1.0 (25.4)	0.025 (0.6)	0.200 (5.0)
4060/PC-8	0.312 (7.9)	0.250 (6.3)	1.0 (25.4)	0.025 (0.6)	0.200 (5.0)
4065	0.500 (12.7)	0.375 (9.5)	1.0 (25.4)	0.032 (0.8)	0.200 (5.0)
4061	0.375 (9.5)	0.250 (6.3)	1.0 (25.4)	0.025 (0.6)	0.200 (5.0)
4067	0.437 (11.1)	0.437 (11.1)	1.5 (38.0)	0.032 (0.8)	0.300 (7.8)
HR 340*	0.500 (12.7)	0.160 (4.0)	1.0 (25.4)	0.020 (0.5)	0.406 (10.3)
HR341*	0.325 (9.3)	0.160 (4.0)	1.0 (25.4)	0.020 (0.5)	0.225 (5.7)

Standard Temperature Coefficient ±10ppm/°C 100Ω up, ±15ppm/°C 10Ω to 100Ω, ±30ppm/°C 1Ω to 10Ω, ±90ppm/°C below 1Ω.
Standard Lead Material - Tinned copper weld NOTE: Optional temperature coefficients available. Consult factory for details.

Fig. I (Round)

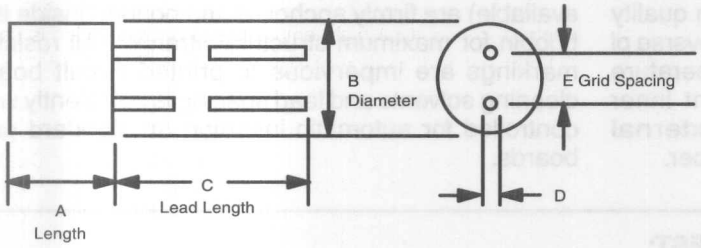
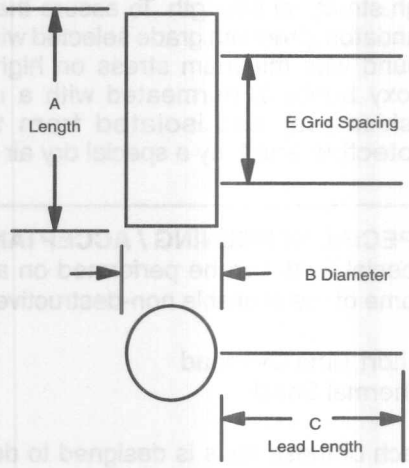


*Fig. II (Radial)



HOW TO ORDER

Sample Part No.:

RB71 W E 10001 B

Style
(Use commercial style if no MIL number)

Characteristic & Terminal
RB product: C = Solderable, W = Weldable
RBR product: L=Solderable, U=Weldable

Resistance Temperature Characteristic

Resistance

Tolerance

For commercial equivalents:
Style - Resistance - Tolerance - TCR

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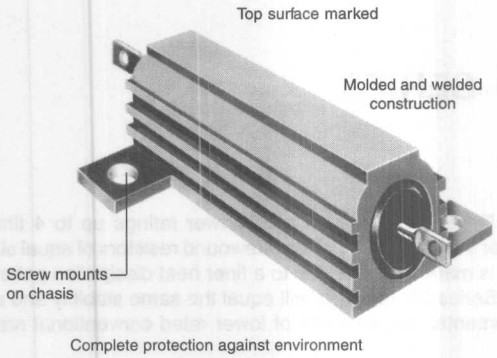
CHASSIS MOUNTED POWER WIREWOUND RESISTOR

ISO-9001 Registered

IRC

AL SERIES



- 0.1 ohm to 180K ohm*
- 5 watts to 50 watts
- ±1% tolerance
- Non-inductive winding available
- High thermal conductivity cores available

*Values down to .01 ohms available. Contact factory with special applications.

SPECIFICATIONS:

IRC/SX Style**	MIL Equiv.	Power Rating @ 25°C(watts) IRC/SX	MIL	Resistance (ohms) Min.	Max.	Max. MIL
AL-5	RE-60G	7.5	5	0.1	16K	3.32K
AL-10	RE-65G	12.5	10	0.1	25K	5.62K
AL-25	RE-70G	25.0	20	0.1	55K	12.1K
AL-50	RE-75G	50.0	30	0.1	180K	39.2K

*All resistors have an operating temperature range of -55°C to +275°C. Derating is required for reduced chassis mounting area and for high ambient temperatures.

**To order non-inductive styles add suffix N (e.g.:ALN-5). (Divide Max. Res. Values by styles available with extended resistance & tolerance ranges; contact factory.

Standard Temperature Coefficient of Resistance:
<1 ohm = ±90 ppm
≥1 ohm to <10 ohms = ±50 ppm
≥10 ohm = ±20 ppm

Power Rating:
5 to 50 watts depending upon style. 275°C maximum hotspot at 25°C ambient. Conforms to MIL-R-18546. 1% maximum ΔR in 1000 hour load life. Proper heat sinks are as follows:
4 X 5 X 2 X 0.040 aluminum chassis - AL-5 and AL-10
5 X 7 X 2 X 0.040 aluminum chassis - AL-25 and AL-50

Construction:
Windings are "controlled stress" wound on ground ceramic cores. Terminations are of welded construction. Terminals are electronically welded to the end caps for maximum strength and electrical continuity. A high temp. silicone encapsulation is used to mold the wound assembly within the anodized aluminum housing.

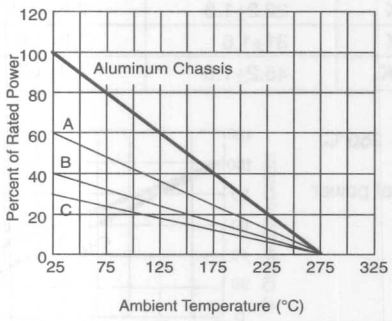
Quality Assurance:
Each IRC/Shallcross resistor order is inspected by Quality Assurance throughout the manufacturing process to verify compliance with all applicable electrical, mechanical and visual requirements per MIL-Std-105 tables.

DIMENSIONS (Inches and (mm)):

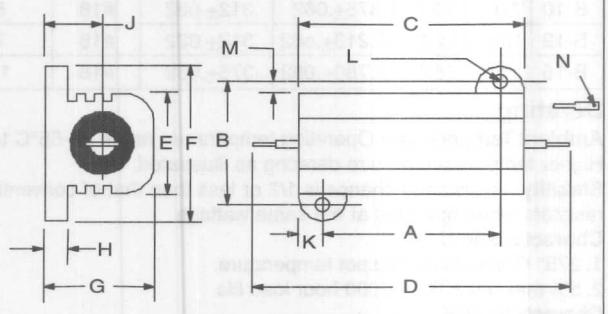
Style	A	B	C	D	E	F	G	H	J	K	L	M	N
Tol.	±0.005	±0.005	±0.031	±0.062	±0.015	±0.015	±0.015	±0.010	±0.010	±0.010	±0.005	±0.015	±0.005
(metric)	±0.1	±0.1	±0.8	±1.6	±0.4	±0.4	±0.4	±0.25	±0.25	±0.25	±0.1	±0.4	±0.1
AL-5	0.444	0.490	0.600	1.035	0.334	0.646	0.320	0.065	0.140	0.078	0.093	0.078	0.050
	(11.28)	(12.45)	(15.24)	(28.58)	(8.48)	(16.41)	(8.13)	(1.65)	(3.56)	(1.98)	(2.36)	(1.98)	(1.27)
AL-10	0.562	0.625	0.750	1.375	0.430	0.800	0.400	0.075	0.190	0.093	0.093	0.102	0.086
	(14.27)	(15.88)	(19.1)	(34.93)	(10.92)	(20.3)	(10.2)	(1.91)	(4.83)	(2.4)	(2.4)	(2.59)	(2.18)
AL-25	0.719	0.781	1.062	1.938	0.530	1.080	0.560	0.085	0.260	0.172	0.125	0.115	0.086
	(18.26)	(19.84)	(26.97)	(49.23)	(13.46)	(27.43)	(14.22)	(2.16)	(6.6)	(4.37)	(3.18)	(2.92)	(2.18)
AL-50	1.563	0.844	1.968	2.781	0.615	1.140	0.615	0.085	0.300	0.196	0.125	0.107	0.086
	(39.7)	(21.44)	(49.99)	(70.64)	(15.62)	(28.96)	(15.62)	(2.16)	(7.62)	(4.97)	(3.18)	(2.71)	(2.18)

DERATING:

AL resistors are rated to operate with a 275°C maximum hotspot under full rated power at 25°C ambient. They must be derated for higher ambient temperature per "Wattage vs. Ambient Temperature Derating Curve."



A = AL5 - AL10 B = AL25 C = AL50

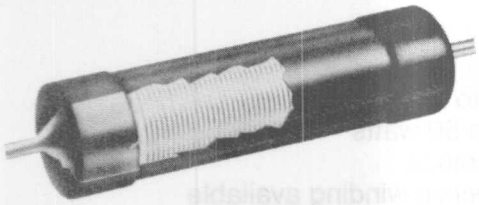


BERYLLIA CORE, SILICONE COATED POWER RESISTORS MIL-R-26 (RW) & COMMERCIAL INDUSTRIAL STYLES

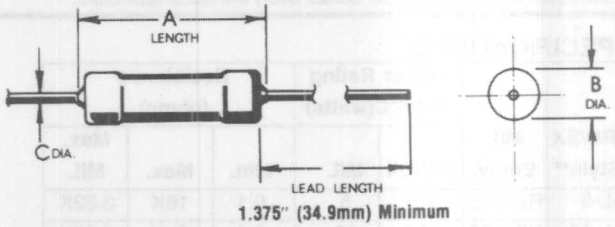
ISO-9001 Registered

IRC

B SERIES



IRC "B" Series resistors offer power ratings up to 4 times higher than standard power wirewound resistors of equal size. This is made possible due to a finer heat dissipation pattern. The Series "B" resistors will equal the same stability and environmental requirements of lower rated conventional resistors.



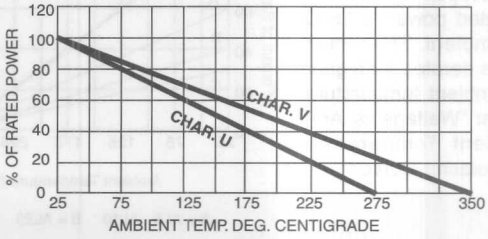
Specifications:

Heat Dissipation: Beryllia core provides finest possible pattern.
Power Rating: Up to 4 times higher than conventional resistors, depending upon physical size.
Power to size ratio: 35% to 400% greater than standard silicone coated types.
Wattage: 1 watt to 18 watts
Standard Temperature Coefficients:
± 20 PPM/°C 10ΩUP
± 50 PPM/°C 1Ω to 9.9Ω
± 400 PPM/°C 0.5Ω to 0.499Ω
± 650 PPM/° C 0.1Ω to 0,499Ω
Special Temperature Coefficients: 22 Special T.C.'s available from -20PPM to +6000 PPM
Tolerance: ±1% to +0.1%
Resistance Values: From .1 to 150K
Coating: Special high temperature silicone coating, impervious to moisture, salt water immersion, and abrasion.
Leads: Tinned copperweld is standard
Dielectric Strength: 500 volts AC for B-1, B-2, B-3: all others 1000 volts.
Insulation Resistance: 5000 megaohms minimum dry

IRC Style	Rated Wattage U	Rated Wattage V	Dimensions Length A	Dimensions Diameter B	Lead Diam. C AWG	IRC Max Resistance	Metric Dimensions Dimensions Length A	Metric Dimensions Dimensions Diameter B	Metric Dimensions Lead Dia. C mm
B-1	1.0		.250±.032	.085±.020	#24	2.0K	6.4± 0.8	2.2 +0.5	0.5
B-2	1.5	2.0	.312±.062	.078±.032	#24	3.4K	7.9±1.6	2.0+.08	0.5
B-3	2.25	2.75	.406±.032	.094±.032	#24	6.5K	10.3±0.8	2.4+.08	0.5
B-5	4.0	5.0	.562±.062	.188±.032	#20	22K	14.3±1.6	4.8+.08	0.8
B-5A	4.5	6.5	.812±.062	.188±.032	#20	34K	20.6±1.6	4.8+.08	0.8
B-5C	5.0	7.0	.500±.062	.218±.032	#18	18K	12.7±1.6	5.5+.08	1.0
B-6	6.0	8.0	.625±.062	.250±.032	#18	40K	15.7±1.6	6.4+.08	1.0
B-10	7.0	10.0	.875±.062	.312±.032	#18	54K	22.2±1.6	7.9+.08	1.0
B-12	10.0	12.0	1.218±.062	.312±.032	#18	75K	31±1.6	7.9+.08	1.0
B-15	15.0	18.0	1.780±.062	.375±.032	#18	150K	45.2±1.6	7.9+.08	1.0

Derating

Ambient Temperature: Operating temperature range of -55°C to + 350°C. Higher temperature require derating as illustrated.
Stability: Resistance chance is 1/2 or less than that of conventional power resistors when operated at the same wattage.
Characteristic U
1. 275° C maximum hotspot temperature.
2. 5% maxium Δ R for 2000 hour load life
Characteristic V
1. 350°C maximum hotspot temperature.
2. 3% maximum Δ R for 2000 hour load life.



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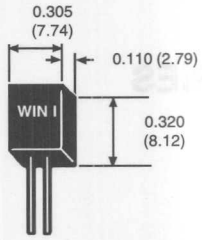
HIGH DENSITY PRECISION WIREWOUND MODULAR RESISTOR

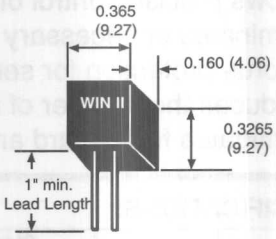
WIN SERIES

WIN I



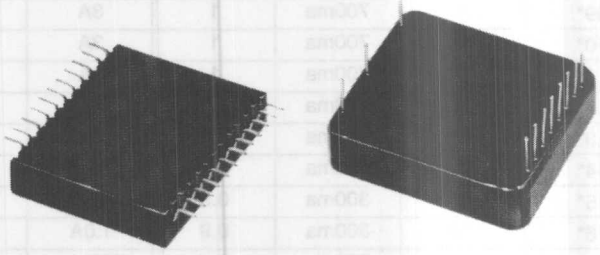
WIN II

For Low Cost &
High Density Packaging



- 0.1 ohm to 500K ohm
- 0.3 watts at 85°C
- 0.01% to 10% tolerance
- Lead spacing: 0.15" ±0.010 (3.81mm±0.254)
- Designed and manufactured to meet the performance requirements of MIL-R-39005
- Standard leads are #22 AWG (0.025") tinned copper weld or tinned copper for both WIN I and WIN II

RESISTOR NETWORKS



- Resistor ratios to 0.001%
- Resistor tolerances to ±0.005% (at ambient)
- Ratio tolerances as close as 0.01% (over a range of temperatures)
- Stability to ±0.003% per year

Network quality is determined by the qualities of its individual resistors plus packaging and mounting techniques.

IRC/Shallcross offers a unique background of experience, reliability, data, manufacturing and testing skills for wirewound resistor networks. For a sample of this ability, submit your next network requirement for evaluation by IRC/Shallcross engineers.

IRC/Shallcross wirewound network designs have included high accuracy laddar networks, summing networks, voltage dividers, current-sensing networks and thermocouple reference junctions.

U.L. APPROVED DUAL FUNCTION FUSE RESISTOR

ISO-9001 Registered

IRC

F500 SERIES

- Acts as a precision wirewound resistor and a fuse
- Allows precise control of fusing point and time lag
- Eliminates unnecessary blowing due to transient conditions
- Affords protection for semiconductor devices
- Reduces the number of discrete components required
- Eliminates fire hazard and circuit board damage due to overheated components

SPECIFICATIONS:

IRC Style	Resistance (ohms)	Steady State		Blow Condition I			Blow Condition II		
		Current	Dissipation (watts)	Current	Dissipation (watts)	Blow Time (T max)	Current	Dissipation (watts)	Blow Time (T max)
F501	0.2	2.2A	1	10A	20	500ms	25A	125	50ms
F502	0.2	2.2A	1	10A	20	300ms	25A	125	30ms
F503	0.5	1.4A	1	6A	18	10sec	15A	112	100ms
F504	0.5	1.4A	1	6A	18	500ms	15A	112	50ms
F505	0.5	1.4A	1	6A	18	50ms	15A	112	10ms
F506	1	1.0A	1	4A	16	10sec	10A	100	100ms
F507	1	1.0A	1	4A	16	500ms	10A	100	50ms
F508	1	1.0A	1	4A	16	50ms	10A	100	10ms
F509*	2	700ma	1	3A	18	10sec	7A	98	50ms
F510*	2	700ma	1	3A	18	200ms	7A	98	50ms
F511*	2	700ma	1	3A	18	50ms	7A	98	10ms
F512*	5	450ma	1	2A	20	200ms	4.5A	101	50ms
F513*	5	400ma	0.8	1.5A	10	50ms	4.0A	80	10ms
F514*	5	350ma	0.6	1.0A	5	100ms	1.4A	10	20ms
F515*	10	300ma	0.9	1.2A	14	200ms	3.0A	90	10ms
F516*	10	300ma	0.9	1.0A	10	100ms	1.3A	17	50ms
F517*	10	200ma	0.4	600ma	3.6	100ms	900ma	8	50ms
F518*	20	220ma	1	600ma	7.2	10sec	900ma	16	100ms
F519*	20	220ma	1	600ma	7.2	100ms	900ma	16	50ms
F520*	20	150ma	0.4	350ma	2.4	500ms	450ma	4	50ms
F521*	50	140ma	1	400ma	8.0	500ms	600ma	18	50ms
F522*	50	130ma	0.8	350ma	6.1	100ms	450ma	10	50ms
F523*	50	80ma	0.3	200ma	2.0	200ms	240ma	2.9	50ms
F524*	100	100ma	1	250ma	6.2	10sec	300ma	9.0	100ms
F525*	100	80ma	0.6	200ma	4.0	200ms	250ma	6.2	50ms
F526*	100	60ma	0.4	140ma	2.6	10sec	180ma	3.2	200ms
F527*	200	70ma	1	200ma	8.0	10sec	250ma	12.5	100ms
F528*	200	60ma	0.8	150ma	4.0	100ms	250ma	12.5	10ms

*UL LISTED - Add "S" To Style Description Contact factory for specification limits beyond these listed.

Resistance Range:
0.2 ohms to 200 ohms

Resistance Tolerance:
10% STD, 5% and 2%

Blow Characteristics:
Per table - 2 point definition

Operating Temperature:
-55°C to +150°C

Temperature Coefficient:
±150 ppm <1W, ±50ppm, 1W and above

Construction:
Intrinsically safe single fusing element - all welded construction - ceramic bobbin - ceramic shell, air encapsulated.
Flameproof construction
Various quality assurance data options available, including conditioning and plot of blow time vs. current.

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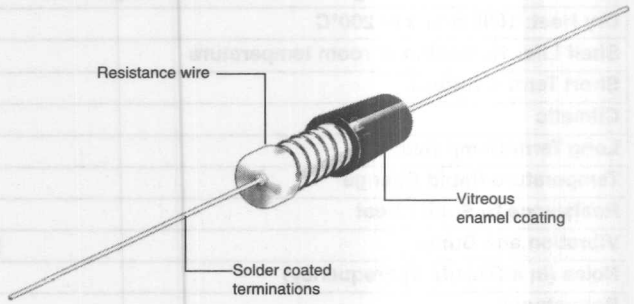
VITREOUS ENAMELLED WIREWOUND RESISTORS

ISO-9001 Registered

W20 SERIES



- Rugged all welded construction
- High purity ceramic substrate
- Impervious lead free vitreous enamel coating
- High power dissipation for size
- High stability and reliability
- Suitable for harsh environments
- Overload characteristics ideal for protection circuits

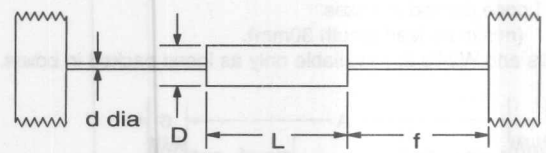
ELECTRICAL DATA:

COMMERCIAL		W21	W215	W22	W23	W24
Power Rating at 25°C	watts	3.0	5.0	7.0	10.0	14.0
Resistance Range at 1% Tolerance	ohms	1 to 10K	1 to 15K	1 to 20K	1 to 60K	1 to 100K
at 2%	ohms	0.5 to 10K	0.5 to 15K	0.5 to 20K	1 to 60K	1 to 100K
at 5%	ohms	0.1 to 10K	0.1 to 15K	0.1 to 20K	0.15 to 60K	0.2 to 100K
TCR(-55°C to 200°C)	ppm/°C	Typically:<+75			Maximum:+200	
Applicable to Commercial and Approved Ranges						
Limiting Element Voltage	volts	100	160	200	500	750
Standard Values		E24 preferred. Other values to special order.				
Thermal Impedance*	°C/watt	88	58	44	29	22
Operating Temperature Range	°C	-55 to 350				

*See temperature rise graph

PHYSICAL DATA:

Dimensions (mm) and Weight (g)					
Type	L max	D max	f min	d nom	Wt nom
W21	12.7	5.6	22.75	0.8	1
W215	22.0	7.0	23.1	0.8	2
W22	22.2	8.0	23.1	0.8	2
W23	38.0	8.0	---	0.8	3.5
W24	53.5	8.0	---	0.8	5



CONSTRUCTION

A high purity ceramic substrate is assembled with interference fit end caps to which are welded the termination wires. The resistive element is wound on the substrate and welded to the caps; the vitreous enamel protective coating is then applied.

TERMINATIONS

Material: Copper clad steel wire, nickel plated and solder-coated.
Length: W23's and W24's are not supplied on tape. Minimum length is 30mm.

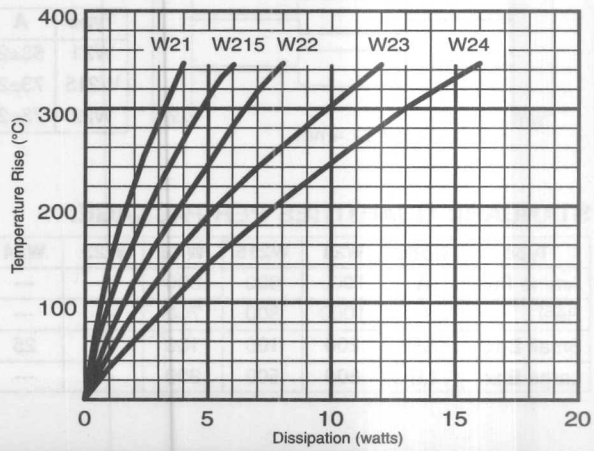
MARKING

The resistors are legend marked with type reference, resistance value and tolerance.

SOLVENT RESISTANCE

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

TEMPERATURE RISE:



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W20 PERFORMANCE DATA:

		ACTUAL PERFORMANCE	
		MAXIMUM	TYPICAL
Load at commercial rating: 1000 hrs at room temperature	ΔR%	5	3.5
Dry Heat: 1000 hours at 200°C	ΔR%	2	1
Shelf Life: 12 months at room temperature	ΔR%	0.03	0.02
Short Term Overload	ΔR%	.47	0.1
Climatic	ΔR%	0.5	0.2
Long Term Damp Heat	ΔR%	0.05	0.02
Temperature Rapid Change	ΔR%	0.5	0.2
Resistance to Solder Heat	ΔR%	0.25	0.03
Vibration and Bump	ΔR%	0.25	0.05
Noise (In a Decade of Frequency)	μV/V	zero	zero
Robustness	ΔR%	0.4	0.05
Insulation Resistance	ohms	>1 Gohm	>1 Gohm
Voltage Proof	volts	500 min	500 min

APPLICATION NOTES:

The terminations should not be bent closer than 1.6 mm from the body, and the recommended minimum bend radius is 1.2 mm. The terminations are solderable to within 4 mm from the body.

When cold, vitreous enamel has excellent insulation resistance. In common with all insulations the specific resistance of the enamel decreases with increase in temperature.

Therefore, resistors operated at near maximum temperature cannot be classed as insulated and should not be used in contact with any conducting material.

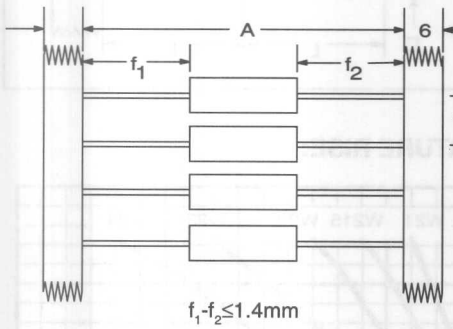
Care must be taken when determining clearance distance between the resistor body and printed circuit board or other components

PACKAGING:

For W21, W215 and W22 resistors the standard method of packaging is taped in ammo packs. Alternatives available by special request are:

- Taped and reeled
- Loose packed in boxes (minimum lead length 30mm).

W23's and W24's are available only as loose packed in boxes.



Type	A
W21	63±2
W215	73±2
W22	73±2

ORDERING PROCEDURE:

Specify type reference etc. as indicated in this example of W21 0.1K ohms 5% taped and ammo packed.

W21 9K1 J A

Type

Value

Tolerance Code
F=1%, G=2%, J=5%

Packaging Details

STANDARD QUANTITIES PER PACKAGE:

Type	Code	W21	W215	W22	W23	W24
Ammo Pack	A	1000	600	500	---	---
Reel	R	1000	800	700	---	---
Small Box	SB	200	100	100	50	25
Large Box	LB	800	500	300	---	---

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